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REV. 5-93

US DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEYS DOCKET NUMBER
P00,1725

U.S. APPLICATION NO. (if known, see 37 CFR 1.5)
09/673746

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/DE99/01185	**20 APRIL 1999**	**20 APRIL 1998**

TITLE OF INVENTION
NETWORK SWITCHING UNIT FOR A COMMUNICATION SYSTEM

APPLICANT(S) FOR DO/EO/US **KLAUS WEHREND**

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay.
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.

5. ☒ A copy of International Application as filed (35 U.S.C. 371(c)(2)) - drawings attached.
   a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2) - drawings attached.

7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. §371(c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.

8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).

9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).

10. ☒ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 C.F.R. 1.97 and 1.98; **(PTO 1449, Prior Art, Search Report).**

12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 C.F.R. 3.28 and 3.31 is included.
    (SEE ATTACHED ENVELOPE)

13. ☒ Amendment "A" Prior to Action.
    ☐ A SECOND or SUBSEQUENT preliminary amendment.

14. ☐ A substitute specification.

15. ☒ A change of address letter attached to the Declaration.

16. ☒ Other items or information:
    a. ☒ Request for Approval of Drawing Modifications, 3 sheets of drawings, Figures 1-3.

    b. ☒ Appointment of Associate Power of Attorney

    c. ☒ EXPRESS MAIL #EJ077703924US dated October 20, 2000.

U.S. APPLICATION NO. (if known, see 37 C.F.R. 1.5) 09/673746	INTERNATIONAL APPLICATION NO. PCT/DE99/01185	ATTORNEY'S DOCKET NUMBER P00,1725

17. ☒ The following fees are submitted:	CALCULATIONS	PTO USE ONLY
BASIC NATIONAL FEE (37 C.F.R. 1.492(a)(1)-(5): Search Report has been prepared by the EPO or JPO . . . . . $860.00 International preliminary examination fee paid to USPTO (37 C.F.R. 1.482) . . $690.00 No international preliminary examination fee paid to USPTO (37 C.F.R. 1.482) but international search fee paid to USPTO (37 C.F.R. 1.445(a)(2) . . . . . $710.00 Neither international preliminary examination fee (37 C.F.R. 1.482) nor international search fee (37 C.F.R. 1.445(a)(2) paid to USPTO . . . . . $1000.00 International preliminary examination fee paid to USPTO (37 C.F.R. 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) . . . . . $ 100.00		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 860.00	
Surcharge of $130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 C.F.R. 1.492(e)).	$	

Claims	Number Filed	Number Extra	Rate		
Total Claims	19 - 20 =	0	X $ 18.00	$	
Independent Claims	01 - 3 =	0	X $ 80.00	$	
Multiple Dependent Claims			$270.00+	$	
TOTAL OF ABOVE CALCULATIONS =				$ 860.00	
Reduction by ½ for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 C.F.R. 1.9, 1.27, 1.28)				$	
SUBTOTAL =				$ 860.00	
Processing fee of $130.00 for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)). +				$	
TOTAL NATIONAL FEE =				$ 860.00	
Fee for recording the enclosed assignment (37 C.F.R. 1.21(h). The assignment must be accompanied by an appropriate cover sheet (37 C.F.R. 3.28, 3.31). $40.00 per property +					
TOTAL FEES ENCLOSED =				$ 860.00	
				Amount to be refunded	$
				charged	$

a. ☒ A check in the amount of $ 860.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of $ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 501519. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 C.F.R. 1.494 or 1.495 has not been met, a petition to revive (37 C.F.R. 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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BOX PCT
IN THE UNITED STATES DESIGNATED/ELECTED OFFICE
OF THE UNITED STATES PATENT AND TRADEMARK OFFICE
UNDER THE PATENT COOPERATION TREATY--CHAPTER II

APPLICANT(S):	KLAUS WEHREND
ATTORNEY DOCKET NO.:	P00,1725
INTERNATIONAL APPLICATION NO:	PCT/DE99/01185
INTERNATIONAL FILING DATE:	20 APRIL 1999
INVENTION:	NETWORK SWITCHING UNIT FOR A COMMUNICATION SYSTEM

Assistant Commissioner for Patents,
Washington D.C. 20231

AMENDMENT "A" PRIOR TO ACTION

Sir:

Applicants herewith amend the above-referenced PCT application, and request entry of the Amendment prior to examination on the United States Examination Phase.

IN THE SPECIFICATION:

On substitute page 1:

replace line 1, with

--SPECIFICATION

TITLE

NETWORK SWITCHING UNIT FOR A COMMUNICATION SYSTEM

BACKGROUND OF THE INVENTION

Field of the Invention

The invention relates to a network switching unit for a communication system fashioned as a subscriber line assembly permitting data to be communicated between networks of different topology with the communication system.

Description of the Related Art–;

in line 4, replace "in the "with –located within the walls of a–;

in line 10, replace "of the" with –the–;

in line 11, replace "Included among the performance features in" with –In–;

in line 12, after "ISDN", insert –(Integrated Services Digital Network)–, and after "are", insert–other features–;

in line 13, after "received", insert –may be included–;

in line 15, replace "wherein" with –in which–;

in line 20, replace "In current" with –Current–, after "systems", insert –may–, and after "example,", insert –realize–;

in line 21, cancel "are realized";

in line 22, after "units", insert –(S_{2M} accesses)–, and cancel "that are also referred to as S_{2M}";

in line 23, cancel "accesses";

in line 25, after "example", insert –,–; and

in line 28, after "as", insert –a–.

On substitute page 2:

in line 1, replace "whereby" with –where–;

in line 5, replace "whereby" with –where–;

in line 8, after "example,", insert –an–;

in line 10, replace "particulars–" with –information–the–;

in line 11, replace "control means" with –controller–;

in line 12, replace "protocol -suited" with –suited for a particular protocol–;

in line 21, after "example", insert –,–;

in line 24, cancel ",";

in line 25, after "information", insert –(–; and

in line 27, replace "thereto" with –to it–, and after "protocol", insert –)–.

On substitute page 2a:

in line 3, after "as", insert –a–;

in line 7, after "example", insert –,–;

in line 8, replace "thereby ensues" with –occurs–;

in line 11, after "as", insert –an–; and

in line 13, replace "given" with –for–, and replace "Given" with –For–.

On page 3:

in line 2, after "example", insert –,–;

above line 4, insert

--SUMMARY OF THE INVENTION--;

in line 4, replace "specifying" with –providing–;

in line 6, cancel " ' "

replace line 7 with

This object is inventively achieved with a network switching unit for a communication system, comprising

at least one data network line unit comprising a data network interface for a connection to a local data network;

a signaling unit for a connection to a control unit of the communication system;

a PCM line unit comprising a bidirectional time-division multiplex-oriented PCM interface for a connection to a switching network module of the communication system, the PCM line unit comprising 1) an assembly switching network module for switching payload connections conducted over the PCM interface; and 2) a DTMF recognition unit for an identification and analysis of control information received via the payload connections in a form of DTMF signals;

the arrangement further comprising:

a conversion unit that is connected to the data network line unit, to the signaling unit and to the PCM line unit, the conversion unit comprising: 1) an

evaluation unit for routing information, that produces an evaluation result; 2) a switching unit for communicating data packets depending on the evaluation result; and 3) a conversion unit for a protocol-suited conversion of the data packets.--

in lines 8-9, cancel "comprised therein";

in line 13, cancel ", respectively,", and replace "therein" with –within–;

in line 15, cancel ", respectively,"; and

in lines 27-28, cancel "comprised therein".

On substitute page 4:

replace lines 9-10 with

-- The inventive arrangement may be a subscriber line assembly of the communications system. Furthermore, the switching unit of the arrangement can be configured for communicating said data packets: a) between internal communication terminal devices connected to said communication system and said local network, and b) between external terminal devices that are connected to further interconnected communication systems forming a communication network and said local network. The communication network may be a digital and/or an analog communication network, and may be a line-bound and/or a radio communication network.

A further embodiment of the inventive arrangement has a non-volatile memory in which a LAN identifier information identifying said data network interface within said local data network is stored; and a volatile memory comprising: 1) a first sub area in which a logical network identifier information for identifying said data network interface and communication terminal devices connected to the local data network (LAN) is stored; and 2) a second sub area in which a communication network identifier information for identifying said [the identification of the] network switching unit within said communication network. In this embodiment said LAN identifier information is an interface-related LAN address whose presence is standard; said logical network identifier information is an Internet protocol address whose presence is standard; and said communication

network identifier information is a communication network telephone number.

The volatile memory may further comprise a third sub area in which further logical network identifier information of further local data networks are stored; and a fourth sub area in which further communication network identifier information are stored, a further logical network identifier information being respectively allocated to a further logical communication network identifier information.

The inventive arrangement may further comprise a further conversion unit for communicating said data packets via said communication network used for converting said logical network identifier information into a communication network identifier information. It may also comprise a security unit for checking routing information communicated to said network switching unit in view of an admissibility for a communication connection between a source and destination device identified by an appertaining routing information, as well as a protocol unit for protected and/or transmission protocol-conforming communication of data packets dependent on a selected transmission protocol.

Other embodiments of the inventive arrangement can include an output unit for communicating stored messages to an external terminal device that are output in a form of an announcement and/or an optical display at said external terminal device, a fictitious terminal port by which a redirection to said fictitious terminal port is established for a call directed to an internal terminal device in a framework of a teleworking logon of an external terminal device for assuming a function of said internal terminal device. The inventive arrangement may also comprise at least one further fictitious terminal port in which a connection setup between an external terminal device and said further fictitious terminal port is provided in a framework of a call initiated from said external terminal device to a further terminal device or from said further terminal device to said external terminal device. The further terminal device may be an internal device or an external terminal device. –

in line 12, cancel ", respectively,";

in line 13, replace "comm" with –communication–;

above line 16, insert

--BRIEF DESCRIPTION OF THE DRAWINGS --;

in line 17, replace "drawing" with –drawings–;

cancel line 18;

in line 19, after "Figure 1", insert –is a block diagram showing–;

in line 21, after "Figure 2", insert –is a block diagram showing–;

in line 23, after "Figure 3", insert –is a block diagram showing–;

above line 25, insert

--DESCRIPTION OF THE PREFERRED EMBODIMENTS--;

in line 26, replace "therein" with –within–;

in lines 27-28, cancel ", respectively,";

in line 29, cancel ",respectively,"; and

in line 31, replace "Further" with –Furthermore–.

On substitute page 5:

replace line 2 with –terminals KA1...KAk–;

in line 3, cancel "terminals KA1,...KAk";

in line 4, after "-", insert –and are–;

in line 6, cancel "(integrated services digital network)";

in line 7, after "as", insert –an–;

replace lines 8-9 with –ISDN-oriented D-channel with a transmission rate of 64 kbit/s. The switching network module KN is connected, via the switching terminal KAk, to a bidirectional,–;

replace lines 11-12 with –IGATE. The switching network module KN is respectively connected, via the further PCM terminals KA1, KA2, to a bidirectional, time-division multiplex-oriented–;

in line 14, replace "Further" with –Furthermore–;

replace lines 17-18 with –terminal SAk. The control unit STE is connected, via the further control terminals SA1,...SA3, first to an HDLC

interface HDLCS arranged at the network switching unit–;

in line 25, replace "processing means DV" with –processor DP–; and

in line 30, after "i.e.", insert –,–.

On substitute page 6:

in line 4, replace "an" with –a–;

in line 8, replace "an" with –a–;

in line 9, replace "an" with –a–, and replace "whereby" with –by which–;

in line 12, replace "whereby" with –by which–;

in line 14, replace "Further" with –Furthermore–;

in line 20, replace "served for communicating" with –communicates–;

in line 22, replace "Further" with –Furthermore–;

replace lines 23-24 with –arranged at the network switching unit IGATE. The signaling unit SE is connectable, via the HDLC interface HDLCS, to the control terminal SAE of the control unit STE of–;

in lines 30-31, cancel "or, respectively"; and

in line 31, replace both instances of "or" with –,–.

On substitute page 7:

in line 5, after "i.e.", insert –,–;

in line 7, cancel ", respectively,";

in line 8, replace "dependent" with –, depending–;

in line 9, replace "Further" with –Furthermore–, and replace "protocol-suited" with –in a protocol-suited manner–;

in line 13, after "AE", insert –,–;

in line 14, after "formed", insert –,–, and after "i.e.", insert –,–;

in line 18, cancel ", respectively,";

in line 19, cancel ", respectively,", and cancel "i.e. an identification or";

in line 20, replace "respectively, address" with –(one–, and after "worldwide", insert –)–;

in lines 22-23, cancel ", respectively,"; and

in lines 29-30, cancel ", respectively,".

On substitute page 8:

in line 11, replace "ALN" with –LAN–;

in line 17, cancel "conceived"; and

in line 30, after the second "(", insert –this–.

On substitute page 9:

in line 1, replace "Further" with –Furthermore–;

in line 5, replace "said" with –this–;

in line 9, after "i.e.", insert –,–;

in line 12, cancel ", respectively,"

in lines 13-14, cancel ", respectively,";

in line 16, replace "said" with –this–;

in line 19, cancel ", respectively,";

in line 20, replace "thereto" with –to it–;

in line 21, cancel ", respectively,"; and

in line 28, replace "Given" with –For–.

On substitute page 10:

in line 3, replace "in1,..., ink" with –rn1,...rnk–;

in line 7, cancel ", respectively,";

in line 9, replace "this being" with –that is–;

in line 12, replace "shall be" with –is–;

in line 13, replace "structogram" with –diagram–;

in line 14, replace "structogram" with –diagram–;

in line 26, replace "Below, only" with –Only–, and cancel ", respectively,";

in line 27, replace "shall be considered, i.e." with –are considered below,

i.e.,–;

in line 28, cancel ", respectively,"; and

in lines 29-30, replace "therein shall be" with –within are–.

On substitute page 11:

in line 2, replace "being" with –is–, and replace "said" with –the–;

in line 3, cancel ", respectively,";

in line 4, after "i.e.", insert –,–;

in line 5, after "protocol", insert –four-byte–;

in lines 5-6, replace ", i.e. it comprises four bytes" with –.–;

in line 6, replace "thereby" with –thus–;

in line 11, replace "thereto" with –to it–;

in line 16, replace "being" with –is–, and replace "said" with –the–;

in line 17, cancel ", respectively,";

in line 22, replace "Further" with –Furthermore–;

in line 25, replace "Given data" with –Data–, and cancel "to be";

in line 28, cancel "these";

in line 29, before "source", insert –the–, and after the last "as", insert –the–; and

in line 31, replace "KNK-R" with –BW-R--.

On substitute page 12:

in line 7, cancel ", respectively,";

in line 8, replace "Given" with –For–;

in line 21, cancel "a";

in line 22, replace "shall be explained" with –is explained below–; and

in line 27, cancel "a".

On page 13:

in line 3, after "a", insert –a–;

in line 7, cancel "the network switching unit IGATE";

in line 9, cancel "[sic]";

in line 15, replace "PINA" with –PIN A–; and

in line 24, cancel ", respectively,".

On substitute page 14:

in lines 1-2, replace "u nit" with –unit–;

in line 20, replace "the log-on thereof" with –its log-on–;

in line 21, replace "ensues" with –occurs–;

in line 22, replace "Given" with –For–;

in line 24, replace "the log-on thereof" with –its logon–; and

in line 30, replace "thereto" with –,–.

On substitute page 15:

in line 7, replace "DEV" with –DV–, and cancel "thereto–;

in line 17, cancel "thereto–;

in line 20, replace "PVX" with –PBX–;

in line 23, replace "Given" with –For-- and

in line 26, cancel ",".

On substitute page 16:

in lines 7-8, replace "as a result whereof the" with –resulting in a–;

in line 9, cancel "arises";

in line 12, replace "ensues" with –occurs–;

in line 14, after "voice", insert –information–; and

in line 21, replace "thereto" with –to this–.

On substitute page 17:

in line 5, replace ", this being" with –which is–;

in line 10, after "example", insert –,–;

in lines 12-13, replace "merely comprised therein" with –simply–; and

in line 17, cancel "thereto–.

On substitute page 18:

in line 2, after "example", insert –,–;

in line 3, after ")", insert –,–;

in line 9, replace "ensues" with –takes place–;

in line 17, cancel ",";

in line 18, after "i.e.", insert –,–; and

in line 31, cancel ", respectively,".

On substitute page 19:

in line 3, cancel the first "-";

in lines 13-14, replace "this corresponds" with –corresponding–; and

in line 22, cancel ", respectively,".

On substitute page 20:

in line 1, replace "wherein" with –in which–;

in line 5, replace "thereat" with –at it–, after "example", insert –,–, and replace "Further" with –Furthermore–;

in line 7, after "SMS", insert –(short message service)–, and cancel "(short message service)";

in line 10, after "example", insert –,–;

in line 14, cancel ", respectively,";

in line 15, cancel ",";

in line 23, replace "as a result whereof" with –resulting in–;

in line 25, cancel "arises"; and

in line 26, replace "Given" with –For–.

On substitute page 21, in line 29, after "example", insert –,–.

On substitute page 22:

in line 5, after "step", insert –,–;

in line 19, replace "DW-R" with –TW-R--; and

in line 20, after "example", insert –,–.

On page 23:

in line 10, replace "Given" with –For–;

in line 11, cancel ", respectively";

in line 15, replace "Further" with –Furthermore–; and

below line 25, insert

-- The above-described apparatus is illustrative of the principles of the present invention. Numerous modifications and adaptions thereof will be readily apparent to those skilled in this art without departing from the spirit and scope of the present invention.--.

IN THE CLAIMS:

On page 24 :

replace line 1 with --WHAT IS CLAIMED IS:--;

Please amend claims 1-15 as follows:

1. (Amended) A network [Network] switching unit arrangement [(IGATE)] for a communication system [(PBX)], [--] comprising:

a [at least one] data network line unit [(LAN-AE)] comprising a data network interface [(LANS)] for a [the] connection to a local data network; [(LAN),]

[-- comprising] a signaling unit [(SE)] for a [the] connection to a control unit [(STE)] of said [the] communication system; [(PBX),]

[-- comprising at least one] a PCM line unit [(PCM-AE)] comprising a bidirectional time-division multiplex-oriented PCM interface [(PCMS)] for a [the] connection to a switching network module [(KN)] of said [the] communication system, said PCM line unit comprising: [(PBX), that]

[-- comprises] an assembly switching network module [(BG-KN)] for switching payload connections conducted over said [the] PCM interface; and [(PCMS),]

[--] a DTMF recognition unit [(DTMF)] for an [the] identification and analysis of control information received via said [the] payload connections in a [the] form of DTMF signals; [,]

said arrangement further comprising:

[-- comprising] a conversion unit [(MH)] that is connected to said [the] data network line unit [(LAN-AE)], to said [the] signaling unit [(SE)] and to said [the] PCM line unit, said conversion unit comprising: [(PCM-AE), and that]

[-- comprises] an evaluation unit [(BW-R)] for routing information, that produces an evaluation result; [,]

[-- comprises] a switching unit [(VM-R)] for communicating [the communication of] data packets depending [dependent] on said [the] evaluation result; [,] and

[-- comprises] a conversion unit [(KV-R)] for a [the] protocol-suited conversion of said [the] data packets.

2. (Amended) An arrangement [Arrangement] according to claim 1, wherein said [characterized in that the] network switching unit [(IGATE)] is [fashioned as] a subscriber line assembly of said [the] communication system [(PBX)].

3. (Amended) An arrangement [Arrangement] according to claim 1 [or 2, characterized in that the] wherein said switching unit [(VM-R) comprises means] is configured for communicating said [the communication of the] data packets: a) [--] between internal communication terminal devices [(KE3, KE$)] connected to said [the] communication system [(PBX)] and said [the] local network [(LAN)], and b) [--] between external terminal devices that are connected to further interconnected communication systems[(KW1, KE2)] forming a

communication network and said [the] local network [(LAN)].

4. (Amended) An arrangement [Arrangement] according to claim 1, wherein said [one of the preceding claims, characterized in that the] communication network [(KO)] is a digital or an analog communication network.

5. (Amended) An arrangement [Arrangement] according to claim 4, wherein said [characterized in that the] communication network [(KO)] is a line-bound [and/] or a radio communication network.

6. (Amended) An arrangement [Arrangement] according to claim 1, further comprising: [one of the preceding claims, characterized in that]

a non-volatile memory in which a [an] LAN identifier information [(mac)] identifying said [serving for the identification of the] data network interface [(LANS)] within said [the] local data network [(LAN)] is stored [in a non-volatile memory (PROM) arranged on the network switching unit (IGATE)]; and

a volatile memory comprising:

a first sub area in which a logical network identifier information [(ipag)] for identifying said [the] data network interface [(LANS)] and communication terminal devices connected to the local data network [(LAN)] is stored [in a first sub-area (SP1) of a memory arranged on the network switching unit (IGATE)]; and

a second sub area in which a communication network identifier information [(rnw)] for identifying said [the identification of the] network switching unit [(IGATE)] within said [the] communication network [(KO) is stored in a second sub-area (SP2) of the memory (SPF)].

7. (Amended) An arrangement [Arrangement] according to claim 6, wherein: [characterized in that]

said [the] LAN identifier information [(mac)] is an interface-related LAN address whose presence is standard;

said [the] logical network identifier information [(ipag)] is an Internet protocol address whose presence is standard; and

said [the] communication network identifier information [(rnw)] is a communication network telephone number.

8. (Amended) An arrangement [Arrangement] according to claim 6, wherein said volatile memory further comprises: [or 7, characterized in that]

a third sub area in which further logical network identifier information [(ipe1,...,ipek)] of further local data networks are stored [in a third sub-area (SP3) of the memory (SPF)]; and

a fourth sub area in which further communication network identifier information [(rn1, ..., rnk)] are stored, [in a fourth sub-area (SP4) of the memory (SPF), whereby] a further logical network identifier information [(ipe1, ..., ipek) and] being respectively allocated to a further logical communication network identifier information [(rn1, ..., rnk) are respectively allocated to one another].

9. (Amended) An arrangement [Arrangement] according to claim 8, further comprising:

a further conversion unit [characterized in that,] for communicating said [the communication of] data packets via said [the] communication network [(KO), the network switching unit (IGATE) comprises a further conversion unit (KNK-R)] used for converting said [the] logical network identifier information [(ipe1, ..., ipek)] into a communication network identifier information [(rn1, ..., rnk)].

10. (Amended) An arrangement [Arrangement] according to claim 1, further comprising: [one of the preceding claims, characterized in that the network switching unit (IGATE) comprises]

a security unit [(FWALL)] for checking [the] routing information

communicated to said [the] network switching unit [(IGATE)] in view of an admissibility for a communication connection between a [the] source and destination device [means] identified by an appertaining routing information.

11. (Amended) An arrangement [Arrangement] according to claim 1, further comprising [one of the preceding claims, characterized in that the network switching unit (IGATE) comprises]

a protocol unit [(PROT)] for protected [and/] or transmission protocol-conforming communication of data packets dependent on a selected transmission protocol.

12. (Amended) An arrangement [Arrangement] according to claim 3, further comprising: [through 11, characterized in that the network switching unit (IGATE) comprises]

an output unit [(-SA)] for [the communication of] communicating stored messages to an external terminal device [(KE2); and in] that [the messages] are output in a [the] form of an announcement [and/] or an optical display at said [the] external terminal device [(KE1)].

13. (Amended) An arrangement [Arrangement] according to claim 1, further comprising: [one of the preceding claims, characterized in that the network switching unit (IGATE) comprises at least one]

a fictitious terminal port [(FP), whereby] by which a redirection to said [the] fictitious terminal port [(FP)] is established for a call directed to an internal terminal device [(KE4)] in a [the] framework of a teleworking logon of an external terminal device [(KE1)] for assuming a [the purpose of an assumption of the] function of said [the] internal terminal device [(KE4)].

14. (Amended) An arrangement [Arrangement] according to claim 13, further comprising: [characterized in that the network switching unit (IGATE)

comprises]

a [at least one] further fictitious terminal port [(RP), whereby] in which a connection setup between an external terminal device [(KE1)] and said [the] further fictitious terminal port [(RP)] is provided in a [the] framework of a call initiated from said [the] external terminal device [(KE1)] to a further terminal device or from said [the] further terminal device to said [the] external terminal device [(KE1)].

15. (Amended) An arrangement [Arrangement] according to claim 13, wherein said [or 14, characterized in that the] further terminal device is an internal terminal device or an external terminal device.

Please add the following claims 16-19.

16. An arrangement according to claim 4, further comprising:

an output unit for communicating stored messages to an external terminal device that are output in a form of an announcement or an optical display at said external terminal device.

17. An arrangement according to claim 6, further comprising:

an output unit for communicating stored messages to an external terminal device that are output in a form of an announcement or an optical display at said external terminal device.

18. An arrangement according to claim 10, further comprising:

an output unit for communicating stored messages to an external terminal device that are output in a form of an announcement or an optical display at said external terminal device.

19. An arrangement according to claim 11, further comprising:

an output unit for communicating stored messages to an external terminal

device that are output in a form of an announcement or an optical display at said external terminal device.

IN THE ABSTRACT:

On page 28:

cancel line 2;

in line 3, replace "By means of a" with –A–;

in line 4, replace ", data can" with –enables data to–;

in line 5, replace "topology" with –topologies–; and

cancel line 11.

REMARKS

The present Amendment revises the specification and claims to conform to United States patent practice, before examination of the present PCT application in the United States National Examination Phase. All of the changes are editorial and applicant believes no new matter is added thereby. The amendment of claims 1-15 and the addition of claims 16-19 is not intended to be a surrender of any of the subject matter of those claims.

Early examination on the merits is respectfully requested.

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NETWORK SWITCHING UNIT FOR A COMMUNICATION SYSTEM

As a result of an increasing flexibility of the working conditions in terms of time and space, the number of those employees who do not perform their professional duties at their work station in the company is constantly increasing. It is known from "Das virtuelle Büro, telcomreport, No. 4, 1997, Siemens AG Berlin and Munich, that, on the one hand, an access to the local data resources of the company (also called 'remote LAN' in the literature) and, on the other hand, an access onto the communication performance features offered in the local communication network of the company (also called 'remote PBX' in the literature) regardless of the location of the employee are needed for an efficient handling of the tasks outside the company. Included among the performance features in addition to the standard performance features in, for example, an ISDN-oriented communication network are, for example, setting up a conference circuit or signalling when a message is received.

In current communication systems, for example, connection possibilities to a communication network brought to the communication system are realized by primary multiplex access units arranged therein that are also referred to as S_{2M} accesses. The communication network can, for example, be realized by an ISDN-oriented communication network (Integrated Service Digital Network). For access to a local data network, for example an Ethernet-LAN (Local Area Network) connecting a plurality of personal computers, via the ISDN-oriented communication network, a connection between the ISDN-oriented communication network and the local data network is realized via an external network switching unit -- often referred to as 'router' in the literature -- connected to a further S_{2M} access. To that end, the 'router' is equipped both with an S_{2M} interface as well as with a standard LAN interface, whereby the S_{2M} interface is connected to the output of the S_{2M} access unit of the communication system and the LAN interface of the 'router' is connected to the local data network.

In view of its critical function, a 'router' realizes the layer 3 (switching layer) of the OSI reference model (Open Systems Interconnection), whereby networks with respectively different topology of the layers 1 (bit transmission layer) and 2

(protection layer) are physically connected with the assistance of a 'router' -- for example, Ethernet-LAN and ISDN-oriented communication network. In order to route data packets between the networks connected to a 'router', the address particulars -- destination and source address -- contained in routing information of the data packets are interpreted and evaluated by a control means located in the 'router'. Subsequently, the data packets are converted protocol-suited for a transmission.

In order to be able to make the performance features realized by the communication network and offered at internal subscriber terminals available at an external terminal device, for example a terminal device connected to the communication system via an ISDN-oriented communication network, in the same way as at an internal terminal device -- as intended in the framework of 'teleworking' –, German Patent Application bearing Serial Number P19808368.8 has already disclosed that terminal device-oriented signalling information as are usually transmitted between the communication system and internal terminal devices connected thereto in the course of a signalling protocol be communicated between the communication system and the external terminal device via a further payload data connection (for example, a second ISDN-oriented B-channel) established in addition to the payload data connection (for example, a first ISDN-oriented B-channel).

The external terminal device is connected via the further payload data connection to a computer (often referred to as 'teleworking server' in the literature) connected to the local data network that controls the transmission of the terminal device-oriented signalling information between the communication system and the external terminal device. A conversion of the data format of the payload data connection, for example the data format of an ISDN-oriented B-channel, onto the data format of the local data network thereby ensues in an external 'router'.

In general, an S_{2M} interface comprises, first, 30 payload data channels that are fashioned as ISDN-oriented B-channels with a transmission rate of 64 kbit/s and, second, a signalling channel that is fashioned as ISDN-oriented D-channel with a transmission rate of 64 kbit/s. This means that the S_{2M} interface for the connection of the external 'router' is only optimally utilized given larger local data networks. Given smaller local data networks, the payload data channels of the S_{2M} interface are

physically occupied by the connection of the 'router', and potentially existing free transmission capacities cannot be used in some other way, for example for the connection of a communication terminal device.

The present invention is based on the object of specifying measures that optimize an access to a data network connected to a communication system, particularly in the framework of 'teleworking.

This object is inventively achieved with the features of patent claim 1.

A critical advantage of the inventive network switching unit is comprised therein that, due to its fashioning as a unit integratable in the communication system, a considerable simplification in the system is achieved compared to an arrangement with an external 'router'. Since the bidirectional time-division multiplex-oriented switching terminals of the switching network module are directly connected via the network switching unit or, respectively, via the conversion unit arranged therein to the local data network connected to the communication system, data packets communicated to the communication system or, respectively, to the network switching unit can be communicated between the networks connected to the communication system -- for example, between an ISDN-oriented communication network and an Ethernet-LAN -- solely with the assistance of the communication system via the network switching unit arranged in the communication system. Due to the arrangement of the network switching unit in the communication system, an economically involved connection of an external 'router' -- for example, an 'ISDN router' –, including the $S2_M$ interface of the communication system needed for the connection of the external 'router' can be foregone, and, thus, a cost-beneficial switching-oriented connection can be created between a local data network -- for example, an Ethernet LAN -- and the communication network-- for example, am ISDN-oriented communication network.

A further advantage of the inventive network switching unit is comprised therein that, due to the concentration of the system components needed for a router functionality and those needed for a 'teleworking' on a common assembly, the program-oriented changes relating to their function can be undertaken in a simple way and without intervention into the controller of the communication system.

A further advantage of the inventive network switching unit is comprised therein that, due to the implementation of the system components needed for a router function and those needed for a 'teleworking' function on a common assembly, only one payload data connection (instead of two payload data connections) for communicating payload data and terminal device-oriented signalling information between the external terminal device and the network switching unit need be set up for offering the performance features realized by the communication system at an external terminal device via a communication network.

Advantageous developments of the invention are indicated in the subclaims.

Due to the arrangement of a DTMF recognition unit and of an output unit for stored voice messages or, respectively, text messages on the network switching unit, the performance features realized by the comm system can also be offered at arbitrary external terminal devices -- and not only a terminal devices configured for 'teleworking'.

An exemplary embodiment of the invention is explained in greater detail below on the basis of the drawing.

Thereby shown are:

Figure 1 a structural image for the schematic illustration of a communication system with a network switching unit arranged therein;

Figure 2 a structural image for the schematic illustration of the critical function units of the network switching unit;

Figure 3 a structural image for the schematic illustration of two communication systems according to Figure 1 arranged in a communication network.

Figure 1 shows a schematic illustration of a communication system PBX with a network switching unit IGATE arranged therein and configured as subscriber line unit. The communication system PBX comprises further subscriber or, respectively, line units - a first and second line unit ABG1, ABG2 are shown by way of example - for connection of communication terminal devices or, respectively, for a connection to further communication systems arranged in a communication network KN. Further, the communication system PBX contains a switching network module

KN comprising a plurality of bidirectional, time-division multiplex-oriented switching terminals KA1,...KAk, whereby the time-division multiplex-oriented switching terminals KA1,...,KAk are configured as PCM terminals (pulse code mode modulation) - also referred to as PCM highways, speech highways or S_{2M} connections. Each PCM highway comprises, first, thirty payload channels that are fashioned as ISDN-oriented B-channels (integrated services digital network) with a transmission rate of 64 kbits/s and, second, comprises a signaling channel that is fashioned as ISDN-oriented D-channel with a transmission rate of 64 kbit/s. Via the switching terminal KAk, the switching network module KN is connected to a bidirectional, time-division multiplex-oriented PCM interface PCMS of the network switching unit IGATE. Via the further PCM terminals KA1, KA2, the switching network module KN is respectively connected to a bidirectional, time-division multiplex-oriented terminal SK of the first and of the second line unit ABG1, ABG2.

Further, a control unit STE comprising a plurality of control terminals SA1,..SAk is arranged in the communication system PBX. The control unit STE is connected to a control input SM of the switching network module KN via a control terminal SAk. Via the further control terminals SA1,...SA3, the control unit STE is connected, first, to an HDLC interface HDLCS arranged at the network switching unit IGATE and, second, is connected to control terminals SM of the first and of the second line unit ABG1, ABG2.

A communication network KN - for example, an ISDN-oriented communication network - composed of a plurality of communication systems connected to one another is connected to a network terminal NA - for example, a bidirectional, time-division multiplex-oriented S_{2M} terminal - of the first line unit ABG1. A first external terminal device KE1 having a data processing means DV that, for example, is fashioned as personal computer or as insert card for an existing terminal device, and a second external terminal device KE2 are connected to the communication network KN. A first internal terminal device KE3 having the communication system-internal telephone number 6833 is connected to a first subscriber terminal T1 - for example, to an S_0 terminal (2B + D, i.e. 2 ISDN-oriented payload channels and one ISDN-oriented signaling channel) of the second line unit

ABG2, and a second internal terminal device KE4 having a communication system-internal telephone number 4711 is connected to a second subscriber terminal T2.

A local network LAN, for example, an Ethernet-LAN (local area network) - is connected via an LAN interface LANS to the network switching unit IGATE. A plurality of computers D-S, TW-R, for example "personal computers" or "multi-media workstations", are connected to one another by the local network LAN.

Figure 2 shows a schematic illustration of the critical function units of the network switching unit IGATE. The network switching unit IGATE comprises an LAN access unit LAN-AE with an LAN interface, whereby the LAN interface LANS can be connected to the local network LAN. The network switching unit IGATE further comprises a PCM line unit PCM-AE having a bidirectional, time-division multiplex-oriented PCM interface PCMS, whereby the PCM interface PCMS can be connected to the switching terminal KAk of the switching network module KN of the communication system PBX. Further, the PCM line unit PCM-AE comprises an assembly switching network module BG-KN connected to the PCM interface PCMS. A DTMF recognition unit DTMF and an output unit S-AE are also arranged in the PCM line unit PCM-AE. The DTMF recognition unit DTMF serves the purpose of recognizing and evaluating control information in the form of DTMF signals received via a payload data connection conducted via the PCM interface PCMS. The output unit S-AE served for communicating stored voice messages to an external terminal device KE2 via a payload data connection.

Further, a signaling unit SE having an HDLC interface HDLCS is arranged at the network switching unit IGATE. Via the HDLC interface HDLCS, the signaling unit SE is connectible to the control terminal SAE of the control unit STE of the communication system PBX. The LAN line unit LAN-AE, the PCM line unit PCM-AE and the signaling unit SE are respectively connected via a terminal UA to a terminal EL, EP, ES of a conversion unit MH arranged at the network switching unit IGATE.

The conversion unit MH comprises a control unit SU. With the assistance of the control unit SU, data communicated to the network switching unit IGATE or, respectively, to the LAN line unit LAN-AE or the PCM line unit PCM-AE or the

signaling unit SE are communicated between the local network LAN and the payload data channels of the communication network KN brought to the network switching unit IGATE.

To this end, the control unit SU of the conversion unit MH comprises an evaluation unit BW-R for evaluating routing information - i.e. destination and source data - contained in data to be communicated and also comprises a switching unit VM-R for communicating the data from and to the local network LAN or, respectively, from and to the communication network KN dependent on the evaluation result. Further, signaling information are converted protocol-suited by a conversion unit KV-R of the control unit SU. To that end and given data to be communicated to the local network LAN, the signaling information incoming at the signaling unit SE are converted into corresponding routing information, and the payload data incoming at the PCM line unit PCM-AE together with the routing information that have been formed are converted into format-suited data, i.e. data adapted to the LAN format, and are communicated to the LAN line unit LAN-AE.

For an exchange of data between the local network LAN connected to the network switching unit IGATE and the communication network KN, the LAN line unit LAN-AE or, respectively, the LAN interface LANS has an unambiguous identification or, respectively, address allocated to it, i.e. an identification or, respectively, address that is valid worldwide. Since the applications that realize the data exchange - for example, a software module realizing data exchange - are resident on different levels of the OSI reference model, a plurality of identifications or, respectively, addresses valid on different levels of the OSI reference model are allocated to the LAN line unit LAN-AE. Thus, an unambiguous, assembly-specific LAN identification mac is allocated to the LAN line unit LAN-AE. The assembly-specific LAN identification mac realizes a hardware address of the LAN interface LANS resident on layer 1 of the OSI reference model and is stored in a non-volatile memory PROM arranged at the network switching unit IGATE.

Additionally, an unambiguous, logical network identification or, respectively, network address ipag is allocated to the LAN line unit LAN-AE. This is four bytes long and represents an address of the layer 3 of the OSI reference model -

for example, an Internet protocol address. The logical network identification ipag identifies both the LAN line unit LAN-AE as well as the local network LAN connected to the LAN line unit LAN-AE. The logical network identification ipag is stored in a memory area SP1 of a volatile memory SPF arranged at the network switching unit IGATE.

The network switching unit IGATE additionally comprises a control unit STW that comprises a protocol unit PROT and a filter unit FWALL. The control STW is connected via control terminals SW to the LAN line unit LAN-AE, to the PCM line unit PCM-AE, to the signaling unit SE of the conversion unit MH and to the memories PROM and SPF. The communication of data to be communicated between the local network ALN, the communication network KN and terminal devices KE3, KE4 internally connected to the communication system PBX is realized by the protocol unit PROT. Realized in the protocol unit PROT are, first, the Internet-specific protocols TCP/IP (transmission control protocol/Internet protocol), H. 323 as well as the PPP protocol (point-to-point protocol) designed for the transport of TCP/IP data packets and of H.323 data packets via a point-to-point connection, and the H.320 protocol conceived for a transmission of voice and data via an ISDN-oriented connection.

A security-oriented decoupling of the networks LAN, KN connected to the network switching unit IGATE is realized by the filter unit FWALL. As a result of the filter function realized in the filter unit FWALL, a data access from the local network LAN onto a potentially further communication system-internal local network is checked for authorization, as is a data access via the communication network KN to the local network LAN as well. For the realization of the filter functions, both the source as well as destination addresses contained in the routing information of the data to be communicated are checked for allowability (this check is often referred to as source and destination checking in the literature). When checking the source address and given a connection setup initiated via the communication network KN, the telephone number of the calling communication terminal device is checked on the basis of a list (not shown) with predetermined, authorized telephone numbers (is often referred to as subscriber authentification in the literature) and, thus, inadmissible

connections via the communication network KN are prevented. Further, the logical network identification ipag of data packets incoming at the LAN line unit LAN-AE are checked. When the source address is authorized for the exchange of data via the network switching unit IGATE, the destination address contained in the routing information is checked according to said criteria. Additionally, an authentification check of the source address can be implemented on the basis of the protocols PAP (password authentification protocol) and CHAP (challenge handshake authentification protocol) provided in the framework of the PPP protocol.

After the data have successfully run through the filter functions, i.e. after confirming the authorization of the data exchange between the communication terminal devices identified by the source and destination address, the destination address or, respectively, logical network identification ipag contained in the data are evaluated by the routing functions realized on the network switching unit IGATE or, respectively, at the conversion unit MH and the protocol unit PROT. When the local network LAN is identified by the logical network identification ipag, the data are correspondingly switched in said way via the conversion unit UE.

The volatile memory SPF also comprises a third memory area SP3 for storing logical destination network identifications ipe1,...ipek of further communication systems arranged in the communication network or, respectively, of the local network connected thereto that are provided for a data exchange with the local network LAN or, respectively, with the communication terminal devices connected to the local network LAN. To this end, a communication network identification rn1,...rnk respectively representing a telephone number of corresponding network switching units arranged in the further communication systems are stored in a fourth memory area SP4 of the volatile memory SPF allocated to the third memory area SP3. At least one communication network identification rn1,..rnk is allocated to every logical destination network identification ipe1,...,ipek stored in the third memory area SP3. Given data to be communicated to a communication system arranged in the communication network KN, the further conversion unit KVK-R arranged in the control unit STW of the network switching unit IGATE determines the corresponding logical destination network identification

ipe1,...,ipek stored in the third memory area SP3, and a corresponding payload data connection is setup via the communication network KN on the basis of the allocated communication network identification in1,...,ink stored in the fourth memory area SP4.

So that further communication systems arranged in the communication network KN can set up a corresponding payload connection to the communication system PBX or, respectively, to the network switching unit IGATE, an unambiguous communication network identification nw is allocated to the network switching unit IGATE, this being stored in a second memory SP2 of the volatile memory SPF.

The exchange of data between local networks LAN1, LAN2 connected to a network switching unit IGATE1, IGATE2 and between a local network LAN1 and an external terminal device KE11 connected to a communication network KN shall be explained in greater detail on the basis of the structogram shown in Figure 3. The structogram schematically shows two communication systems PBX1, PBX2 arranged in a communication network KN and configured according to Figure 1. The two communication systems PBX1, PBX2 are connected via a PCM line unit PCM-AE1, PCM-AE2 to the communication network KN. Both communication systems PBX1, PBX2 comprise a network switching unit IGATE1, IGATE2 according to Figure 2.

The network switching unit IGATE1 arranged in the first communication system PBX1 comprises a first LAN line unit LAN-AE having an LAN interface (not shown). The first LAN line unit LAN-AE1 has a logical network identifier ipag1 = 139.1.20.0 allocated to it that is four bytes long. The network switching unit IGATE2 arranged in the second communication system PBX2 comprises a second LAN line unit LAN-AE2 having an LAN interface (not shown). The second LAN line unit LAN-AE2 has a logical network identification ipag2 = 140.7.27.0 allocated to it. Below, only logical network identifications ipag or, respectively, the Internet protocol addresses allocated to the individual units or local networks shall be considered, i.e. the transport realized in the layers 3 and 4 of the OSI reference model or, respectively, the exchange of data packets controlled by the TCP/IP protocols arranged therein shall be explained in greater detail.

A first local network LAN1 is connected to the first LAN line unit LAN-AE1, a communication terminal device KE10 being connected via said first local network LAN1 to the network switching unit IGATE1 or, respectively, to the first communication system PBX1. The logical network identification, i.e. the standardized Internet protocol address, is structured according to version 4, i.e. it comprises four bytes. The local network can thereby be unambiguously identified by the addressing information covering the first three bytes; the communication terminal KE10 in the local network can be identified by the addressing information covering the last byte. Due to the allocation of the Internet protocol address ipage1 = 139.1.20.0 to the first LAN line unit LAN-AE1, both the first LAN line unit LAN-AE1 as well as the first local network LAN1 connected thereto are identified by the first three bytes ipag = 139.1.20. Correspondingly, the communication terminal device KE10 connected to the first local network LAN1 exhibits the Internet protocol address ipag = 139.1.20.1.

A second logical network LAN2 is connected to the second LAN line unit LAN-AE2, a communication terminal device KE12 being connected via said second local network LAN2 to the network switching unit IGATE2 or, respectively, to the second communication system PBX2. The second local network LAN2 connected to the second LAN line unit LAN-AE2 has the Internet protocol address ipag = 140.7.27 allocated to it. The communication terminal device KE12 connected to the second local network LAN2 correspondingly comprises the Internet protocol address ipag = 140.7.27.1. Further, an external communication terminal device KE11 that exhibits the Internet protocol address ipag = 172.16.0.8 is connected to the communication network KN.

Given data - indicated by a dotted line V1 - to be communicated from the communication terminal device KE10 connected to the first communication system PBX1 to the communication terminal device KE12 connected to the second communication system PBX2, these exhibit the Internet protocol address ipag = 139.1.20.1 as source address and the Internet protocol address ipag = 140.7.27.1 as destination address. On the basis of the destination address and with the assistance of the evaluation and switching units KNK-R, VM-R arranged at the network switching

unit IGATE1, the telephone number of the network switching unit IGATE2 arranged in the second communication system PBX2 is identified and a corresponding payload data connection is setup to the network switching unit IGATE2 addressed on the basis of the telephone number. According to the destination address ipag = 140.7.27.1, the evaluation and switching units BW-R, VM-R arranged at the network switching unit IGATE2 communicate the communicated data packets to the second local network LAN2 or, respectively, to the communication terminal device KE12.

Given data - indicated by a broken line V2 - to be communicated from the external communication terminal device KE11 connected to the communication network KN to the communication terminal device KE10 connected to the first communication system PBX1, a payload data connection between the external communication terminal device KE11 and the network switching unit IGATE1 arranged in the first communication system PBX1 is setup in a first step on the basis of the telephone number of the network switching unit IGATE1 in the first communication system PBX1. The communicated data have the Internet protocol address ipag = 172.16.0.8 as source address and the Internet protocol address ipag = 139.1.20.1 as destination address. The communicated data packets are communicated according to the destination address ipag = 139.1.20.1 to the first local network LAN1 or, respectively, to the communication terminal device KE10 by the evaluation and switching units BW-R, VM-R arranged at the network switching unit IGATE1.

The collaboration of the critical system components needed for a "teleworking" shall be explained in greater detail below on the basis of Figures 1 and 2.

For offering performance features realized by the communication system PBX and available at internal subscriber terminals T1, T2 at an external communication terminal device connected to the communication network KN and configured for a "teleworking", terminal device-oriented signaling information that are based on a signaling protocol Cornet-TS as usually available in the signaling exchange between internal terminal devices KE3, KE4 and the communication system PBX are communicated between the external communication terminal device and the communication system PBX. The communication of the terminal device-oriented

signaling information between the external communication terminal device and the communication system PBX is controlled, for example, by a computer - referred to below as teleworking computer TW-R - arranged in the local network LAN.

When, for example, a "teleworking" log-on is initiated by a subscriber at the first external terminal device KE1, then a payload data connection DV - shown with broken lines in Figure 1 - between the first external terminal device KE1 and the teleworking computer TW-R is set up via the network switching unit IGATE via the first line unit ABG1, the switching network module KN and the network switching unit IGATE. [sic]

For the log-on of the first external terminal device KE1 at the teleworking computer TW-R, for example, the subscriber inputs the communication system-internal telephone number of an internal terminal device allocated to the subscriber - for example, the telephone number 4711 of the second internal terminal device KE4 - and inputs an appertaining, subscriber-associated identifier PIN (private identification number) - for example, the PINA. The log-on information are communicated via the payload data connection DV to the teleworking computer TW-R. When no internal terminal device KE3-KE4 connected to the communication system PBX is allocated to the subscriber, the telephone number of a fictitious terminal port of the communication system PBX can be communicated as an alternative - i.e., a purely logically existing terminal port that is only established in terms of administration and maintenance and exhibits no hardware components.

A check of the log-on of the first external terminal device KE1 occurs on the basis of a list (not shown) stored in the teleworking computer TW-R that contains in the internal communication system telephone numbers or, respectively, identifiers PIN authorized for the "teleworking". When the check has confirmed the log-on, the teleworking computer TW-R assigns a fictitious terminal port - for example, the fictitious terminal port FP having the internal communication system telephone number 3200 - of the network switching unit IGATE to the first external terminal device KE1. Due to the activation of the performance feature "call redirection" realized by the communication system PBX, all calls directed to the internal terminal port referenced by the internal communication system telephone number are

simultaneously redirected to the fictitious terminal port FP of the network switching unit IGATE.

Additionally, all terminal device-oriented signaling information (assuming the log-on of the first external terminal device KE1 at the communication system PBX with the internal communication system telephone number of the second internal terminal device KE4) to be communicated from the control unit STE of the communication system PBX to the second internal terminal device KE4 (internal communication system telephone number 4711) are redirected to the fictitious terminal port FP (with the internal communication system telephone number 3200) of the network switching unit IGATE. The terminal device-oriented signaling information are communicated from the control unit STE of the communication system PBX to the network switching unit IGATE, which communicates them to the first external terminal device KE1 in the way described above.

By communicating terminal device-oriented signaling information based on the signaling protocol Cornet-TS to the first external terminal device KE1, all performance features realized by the communication system PBX are made available to the first external terminal device KE1 in the same way they are made available to the second internal terminal device KE4. A communication of terminal device-oriented signaling information from the first external terminal device KE1 - assuming the log-on thereof at the communication system PBX - to the control unit STE of the communication system PBX ensues in the same way in the opposite direction.

Given a connection setup - which, for example, ensues by lifting up the receiver at the first external terminal device KE1 - initiated by the first external terminal device KE1 - assuming the log-on thereof at the communication system PBX - to a further (internal or external) terminal device - for example, to the first internal terminal device KE3 -, a connection setup message is communicated via the payload data connection DV to the teleworking computer TW-R. The teleworking computer TW-R forwards a connection setup message for the fictitious terminal port FP of the network switching unit IGATE to the control unit STE of the communication system PBX. In response thereto and in a first step, the control unit STE of the communication system PBX sets up a sub-connection between the fictitious terminal

port FP of the network switching unit IGATE and the switching network module KN of the communication system PBX by occupying a free payload channel of the PCM highway that connects the network switching unit IGATE to the switching network module KN.

In a next step, the teleworking computer TW-R communicates a readiness message to the first external terminal device KE1 via the payload data connection DEV. In response thereto, the first external terminal device KE1 sends the telephone number allocated to the first external terminal device KE1 in the communication network KN to the teleworking computer TW-R in a reply message. In a further step, a further sub-connection to the first external terminal device KE1 is setup from a further fictitious terminal port RP of the network switching unit IGATE (often referred to as "remote port" in the literature). After the switching of the sub-connection to the further sub-connection in the assembly switching network module BG-KN of the network switching unit IGATE, a dial tone sounds at the first external terminal device KE1 (signaling the readiness to input dial information).

The dial information - for example, 6833 for the first internal terminal device KE3 - input in response thereto at the first external terminal device KE1 are communicated via the payload connection DV to the network switching unit IGATE and are forwarded from the latter to the control unit STE of the communication system PVX. Subsequently, a terminal device connection between the first internal terminal device KE3 and the first external terminal device KE1 is setup by the control unit STE of the communication system PBX.

Given a connection setup to the second internal terminal device KE4 proceeding from a further (external or internal) terminal device - assuming the log-on of the first external terminal device KE1 with the internal communication system telephone number of the second internal terminal device KE4 - , a sub-connection between the further terminal device and the fictitious terminal port FP of the network switching unit IGATE is setup by the communication system PBX on the basis of the activated call redirection for the second internal terminal device KE4. In a next step, the teleworking computer TW-R communicates a readiness message to the first external terminal device KE1 via the payload connection DV. The first external

terminal device KE1 subsequently sends the telephone number allocated to the first external terminal device KE1 in the communication network KN to the teleworking computer TW-R in a reply message. In a further step, a further sub-connection to the first external terminal device KE1 is setup proceeding from a further fictitious terminal port RP of the network switching unit IGATE. In a final step, the sub-connection and the further sub-connection are coupled in the assembly switching network module BG-KN of the network switching unit IGATE, as a result whereof the terminal device connection between the first external terminal device KE1 and the further terminal device arises.

A communication of the voice and of the terminal device-oriented signaling information between the network switching unit IGATE and the first external terminal device KE1 ensues with H.323 data packets on the basis of the PPP protocol. With the assistance of the H.323 protocol, the terminal device-oriented signaling information to be communicated and the voice are compressed and converted into data packets based on the TCP/IP protocol.

After the end of the terminal device connection existing between the first external terminal device KE1 and the further terminal device, the further fictitious terminal port RP of the network switching unit IGATE is released by the teleworking computer TW-R and is thus available for a new connection setup between an arbitrary terminal device logged on at the communication system PBX and a further terminal device. In contrast thereto, the fictitious terminal port FP of the network switching unit IGATE remains allocated to the first external terminal device KE1 and is only released after a log-off of the first external terminal device KE1 initiated by the subscriber. After the log-off and due to the deactivation of the call redirection at the communication system PBX, the terminal device-oriented signaling information to be communicated to the subscriber by the control unit STE of the communication system PBX are communicated to the terminal port of the internal terminal device allocated to the subscriber - for example, at the terminal port of the second internal terminal device KE 4 having the internal communication system telephone number 4711.

For offering performance features realized by the communication system PBX and available at internal subscriber terminals T1, T2 to an arbitrary external

communication terminal device connected to the communication network KN, control information in the form of DTMF signals (dual tone multi-frequency) are communicated from the external terminal device to the network switching unit IGATE via a voice connection. For the DTMF signals, a characteristic signal is allocated to each key of a terminal device, this being communicated via the voice connection when the key is actuated. The signal differs in frequency and signal duration from the data usually communicated via the voice connection, so that the signals can be identified and interpreted at the network switching unit IGATE.

The external terminal device can be connected to the communication system via an arbitrary communication network, for example an analog communication network, an ISDN-oriented communication network or a radio telephone network. The demands made of the external terminal device are merely comprised therein that the MFV dial method (multi-frequency dial method) for generating DTMF signals is supported by the external terminal device.

For a log-on of the second external terminal device KE2 at the communication system PBX, a subscriber inputs, for example, a "teleworking" telephone number at the second external terminal device KE2. In response thereto, a voice connection is setup between the second external terminal device KE2 and the network switching unit IGATE.

For an identification of the second external terminal device KE2 at the communication system PBX, the output unit S-AE arranged at the network switching unit IGATE communicates a first, recorded voice message to the second external terminal device KE2 that prompts the subscriber to input the telephone number allocated to the second external terminal device KE2 in the communication network KN - referred to below as manual identification. Additionally, a second recorded voice message is communicated from the output unit S-AE to the second external terminal device KE2 for an authentification of the subscriber, this prompting the subscriber to input a personal identification number PIN. These identification and authentification data communicated in the form of DTMF signals via the voice connection are interpreted by the DTMF recognition unit DTMF and are forwarded via the LAN line unit LAN-AE to the teleworking computer TW-R. The teleworking

computer TW-R enters the second external terminal device KE2 as being identified, for example with an entry of the second external terminal device KE2 in a list (not shown) insofar as this was not already carried out in an earlier identification.

As result of the identifier PIN communicated in the authentification data, that internal subscriber terminal port of the communication system PBX via which the subscriber would like to log on at the communication system PBX is identified on the basis of a list (not shown) stored in the teleworking computer TW-R. When the identifier PIN A is communicated during the framework of the authentification, for example, then a log on of the second external terminal device KE2 ensues for the second internal terminal device KE4. Additionally, the subscriber can be requested to communicate a personal password.

When the telephone number allocated to the second external terminal device KE2 in the communication network KN - for example, in the framework of an ISDN connection (in the framework of the performance feature "calling party number") - was automatically communicated from the second external terminal device KE2 to the network switching unit IGATE - also referred to below as automatic identification - , a check is carried out in the teleworking computer TW-R to see whether the second external terminal device KE2 has already been identified, i.e. whether an entry for the second external terminal device KE2 is already present in the list. When the second external terminal device KE 2 has not yet been identified, the output unit S-AE of the network switching unit IGATE communicates the second recorded voice message to the second external terminal device KE2, this prompting the subscriber to input the personal identifier PIN and/or the personal password.

Alternatively, the identifier PIN communicated by the subscriber can be allocated to a fictitious terminal port of the communication system PBX. Subscribers to whom no physically existing internal terminal device is allocated can thus also use the performance features of the communication system PBX at the external terminal device.

A check of the log-on of the second external terminal device KE2 occurs on the basis of a list (not shown) stored in the teleworking computer TW-R that contains the internal communication system telephone numbers or, respectively,

identifiers PIN authorized for the "teleworking". When the check has confirmed the log-on, a fictitious terminal port - for example, the fictitious terminal port FP having the communication system - internal telephone number 3200 - of the network switching unit IGATE is allocated to the second external terminal device KE2 by the teleworking computer TW-R. At the same time and due to the activation of the performance feature "call redirection" realized by the communication system PBX, all calls directed to the internal subscriber terminal port (for example, the second subscriber terminal T2 of the second line unit ABG2 with the internal communication system telephone number 4711) identified by the internal communication system telephone number of, respectively, by the identifier PIN are redirected to the fictitious terminal port FP of the network switching unit IGATE.

When, following the log-on, the voice connection is interrupted, for example by hanging up the receiver at the second external terminal device KE2 (this corresponds to the normal case), then a renewed identification (communication of the telephone number allocated to the second external terminal device KE2 in the communication network KN) of the second external terminal device KE2 at the communication system PBX is necessary in order to setup a new voice connection to the network switching unit IGATE. Additionally, the authentification data must be re-transmitted in the framework of the manual identification.

Assuming the log-on of the second external terminal device KE2 at the communication system PBX with the internal communication system telephone number or, respectively, identifier of the second internal terminal device KE4, the control unit STE of the communication system PBX additionally redirects terminal device-oriented signaling information to be communicated to the second internal terminal KE4 to the fictitious terminal port FP of the network switching unit IGATE. In the above-described way, the control unit STE of the communication system PBX communicates the terminal device-oriented signaling information to the teleworking computer TW-R via network switching unit IGATE.

In the teleworking computer TW-R, a message (for example, a terminal device-oriented signaling information) communicated from the control unit STE of the communication system PBX to the fictitious terminal port FP is evaluated, and, in

instances wherein this message is to be forwarded to the second external terminal device KE2, is converted into a voice message corresponding to the terminal device-oriented signaling information. The voice message is subsequently communicated via a newly established voice connection to the second external terminal device KE2 and is output thereat, for example via a loudspeaker. Further, there is the possibility of communicating messages corresponding to the terminal device-oriented signaling information to SMS-compatible terminal devices (short message service), particularly radio terminal devices. To this end, a message is communicated to the appertaining "network provider", who communicates the corresponding text message to the terminal device at which the text message is output, for example at a display.

When, proceeding from a further (external or internal) terminal device, a connection setup to the second internal terminal device KE4 is initiated - assuming the log-on of the second external terminal device KE2 at the communication system PBX with the internal communication system telephone number or, respectively, identifier of the second internal terminal device KE4 -, a sub-connection between the further terminal device and the fictitious terminal port FP of the network switching unit IGATE is setup due to the activated call redirection. In a further step, a further sub-connection between a further fictitious terminal port RP of the network switching unit IGATE and the second external terminal device KE2 is setup on the basis of the telephone number of the second external terminal device KE2 in the communication network KN communicated in the identification data. In a final step, the sub-connection and the further sub-connection are coupled in the assembly switching network module BG-KN of the network switching unit IGATE, as a result whereof a terminal device connection between the second external terminal device KE2 and the further terminal device arises.

Given a connection setup initiated by the second external terminal device KE2 to a further (internal or external) terminal device, a voice connection to the further fictitious terminal port RP of the network switching unit IGATE is setup on the basis of a renewed input of the "teleworking" telephone number. After a communication of the identification data via the voice connection, the output unit S-AE of the network switching unit IGATE communicates a recorded voice message to

the second external terminal device KE2 that informs the subscriber about possible user actions such as, for example, output of a voice message stored in the communication system PBX or setup of a terminal device connection proceeding from the second external terminal device KE2 to a further terminal device. Due to the input of a significant key combination at the second external terminal device KE2, a control information corresponding to the key combination is communicated in the form of DTMF signals via the voice connection to the network switching unit IGATE that signals the communication system PBX that, proceeding from the fictitious terminal port FP of the network switching unit IGATE, a terminal device connection is to be setup to a further terminal device. Subsequently, the control unit STE of the communication system PBX sets up a sub-connection between the fictitious terminal port FP of the network switching unit IGATE and the switching network module KN of the communication system PBX by occupying a free payload channel of the PCM highway connecting the switching network module KN and the network switching unit IGATE.

After a coupling of the voice connection with the sub-connection in the assembly switching network module BG-KN of the network switching unit IGATE, the dial tone sounds at the second external terminal device KE2. The dial information subsequently input at the second external terminal device KE2 - for example 6833 for the first internal terminal device KE3 - are communicated to the network switching unit IGATE in the form of DTMF signals via the voice connection and this network switching unit IGATE forwards these to the control unit STE of the communication system PBX. Subsequently, the control unit STE of the communication system PBX sets up a terminal device connection between the second external terminal device KE2 and the first internal terminal KE3.

When there is the possibility at the second external terminal device KE2 of communicating the telephone number allocated to the second external terminal device KE2 in the communication network KN automatically to the network switching unit IGATE, for example in the framework of an ISDN connection (in the framework of the performance feature "calling party number"), then the subscriber can initialize a connection setup proceeding from the communication system PBX by inputting a

specific "teleworking" telephone number. The network switching unit IGATE recognizes on the basis of the specific "teleworking" telephone number that a terminal device connection to a further terminal device is to be setup from the second external terminal device KE2 and does not accept the call of the second external terminal device KE2. In a next step and proceeding from the communication system PBX, a connection proceeding from the further fictitious terminal port RP of the network switching unit IGATE is set up to the second external terminal device KE2 on the basis of the telephone number of the second external terminal device KE2 in the communication network KN automatically communicated in the framework of the ISDN connection, so that no charges for the terminal device connection to the further terminal device to be setup are incurred by the subscriber at the second external terminal device KE2.

The control information sent from the second external terminal device KE2 during a terminal device connection existing between the second external terminal device KE2 and a further terminal device are communicated to the network switching unit IGATE in the form of DTMF signals via the terminal device connection. The control information are identified at the network switching unit IGATE by the DTMF recognition unit DTMF and are forwarded to the teleworking computer TW-R. In the teleworking computer DW-R, the received control data are converted into terminal device-oriented signaling information, for example on the basis of a list (not shown). These converted terminal device-oriented signaling information are forwarded via the network switching unit IGATE to the control unit STE of the communication system PBX. If the control information communicated by the second external terminal device KE2 in the form of DTMF signals cannot be interpreted by the network switching unit IGATE, then the DTMF signals are forwarded to the further terminal device.

After the end of the terminal device connection existing between the second external terminal device KE2 and the further terminal device, the further fictitious terminal port RP of the network switching unit IGATE is released by the teleworking computer TW-R and is thus available for a new connection setup between an arbitrary terminal device logged on at the communication system PBX and a

further terminal device. The fictitious terminal port FP of the network switching unit IGATE, in contrast, remains allocated to the second external terminal device KE 2 and is only enabled after a log off of the second external terminal device KE2 initiated by the subscriber. After the log off and due to the deactivation of the call redirection at the communication system PBX, the terminal device-oriented signaling information to be communicated from the control unit STE of the communication system PBX to the subscriber are communicated to the terminal port of the internal terminal device allocated to the subscriber - for example, at the terminal port of the second internal terminal device KE4 having the internal communication system telephone number 4711. Given a log-on of a further external terminal device with the same internal communication system telephone number or, respectively, identifier as the second external terminal device KE2, the fictitious terminal port FP of the network switching unit IGATE is allocated to the further external terminal device.

A maximum of 256 fictitious terminal ports can be configured at the network switching unit IGATE. Further, the network switching unit IGATE is connected to the switching network module KN of the communication system PBX in the form of PCM highways via 128 payload channels. Since two payload channels are required for each terminal device connection of a logged on terminal device to a further terminal device, a maximum of the 64 terminal device connections can be simultaneously set up via the network switching unit IGATE. Since, given a maximum of 64 simultaneously setup terminal device connections, 64 further fictitious terminal ports RP of the network switching unit IGATE are occupied by the terminal device connections, 191 free fictitious terminal ports FP of the network switching unit IGATE are available for a log on of terminal devices at the communication system PBX.

Patent Claims

1. Network switching unit (IGATE) for a communication system (PBX),

-- comprising at least one data network line unit (LAN-AE) comprising a data network interface (LANS) for the connection to a local data network (LAN),

-- comprising a signalling unit (SE) for the connection to a control unit (STE) of the communication system (PBX),

-- comprising at least one PCM line unit (PCM-AE) comprising a bidirectional time-division multiplex-oriented PCM interface (PCMS) for the connection to a switching network module (KN) of the communication system (PBX), that

-- comprises an assembly switching network module (BG-KN) for switching payload connections conducted over the PCM interface (PCMS),

-- a DTMF recognition unit (DTMF) for the identification and analysis of control information received via the payload connections in the form of DTMF signals,

-- comprising a conversion unit (MH) that is connected to the data network line unit (LAN-AE), to the signalling unit (SE) and to the PCM line unit (PCM-AE), and that

-- comprises an evaluation unit (BW-R) for routing information,

-- comprises a switching unit (VM-R) for the communication of data packets dependent on the evaluation result, and

-- comprises a conversion unit (KV-R) for the protocol-suited conversion of the data packets.

2. Arrangement according to claim 1, characterized in that the network switching unit (IGATE) is fashioned as subscriber line assembly of the communication system (PBX).

3. Arrangement according to claim 1 or 2, characterized in that the switching unit (VM-R) comprises means for the communication of the data packets

-- between internal communication terminal devices (KE3, KE$) connected to the communication system (PBX) and the local network (LAN), and

-- between external terminal devices that are connected to further interconnected communication systems (KW1, KE2) forming a communication network and the local network (LAN).

4. Arrangement according to one of the preceding claims, characterized in that the communication network (KN) is a digital or an analog communication network.

5. Arrangement according to claim 4, characterized in that the communication network (KN) is a line-bound and/or a radio communication network.

6. Arrangement according to one of the preceding claims, characterized in that an LAN identifier information (mac) serving for the identification of the data network interface (LANS) within the local data network (LAN) is stored in a non-volatile memory (PROM) arranged on the network switching unit (IGATE);
a logical network identifier information (ipag) for identifying the data network interface (LANS) and communication terminal devices connected to the local data network (LAN) is stored in a first sub-area (SP1) of a memory arranged on the network switching unit (IGATE); and
a communication network identifier information (rnw) for the identification of the network switching unit (IGATE) within the communication network (KN) is stored in a second sub-area (SP2) of the memory (SPF).

7. Arrangement according to claim 6, characterized in that the LAN identifier information (mac) is an interface-related LAN address whose presence is standard;

the logical network identifier information (ipag) is an Internet protocol address whose presence is standard; and

the communication network identifier information (rnw) is a communication network telephone number.

8. Arrangement according to claim 6 or 7, characterized in that

further logical network identifier information (ipe1,...,ipek) of further local data networks are stored in a third sub-area (SP3) of the memory (SPF); and

further communication network identifier information (rn1, ..., rnk) are stored in a fourth sub-area (SP4) of the memory (SPF), whereby a further logical network identifier information (ipe1, ..., ipek) and a further logical communication network identifier information (rn1, ..., rnk) are respectively allocated to one another.

9. Arrangement according to claim 8, characterized in that, for the communication of data packets via the communication network (KN), the network switching unit (IGATE) comprises a further conversion unit (KNK-R) for converting the logical network identifier information (ipe1, ..., ipek) into a communication network identifier information (rn1, ..., rnk).

10. Arrangement according to one of the preceding claims, characterized in that the network switching unit (IGATE) comprises a security unit (FWALL) for checking the routing information communicated to the network switching unit (IGATE) in view of an admissibility for a communication connection between the source and destination means identified by an appertaining routing information.

11. Arrangement according to one of the preceding claims, characterized in that the network switching unit (IGATE) comprises a protocol unit (PROT) for protected and/or transmission protocol-conforming communication of data packets dependent on a selected transmission protocol.

12. Arrangement according to claim 3 through 11, characterized in that the network switching unit (IGATE) comprises an output unit (-SA) for the communication of stored messages to an external terminal device (KE2); and in that the messages are output in the form of an announcement and/or an optical display at the external terminal device (KE1).

13. Arrangement according to one of the preceding claims, characterized in that the network switching unit (IGATE) comprises at least one fictitious terminal port (FP), whereby a redirection to the fictitious terminal port (FP) is established for a call directed to an internal terminal device (KE4) in the framework of a 'teleworking' logon of an external terminal device (KE1) for the purpose of an assumption of the function of the internal terminal device (KE4).

14. Arrangement according to claim 13, characterized in that the network switching unit (IGATE) comprises at least one further fictitious terminal port (RP), whereby a connection setup between an external terminal device (KE1) and the further fictitious terminal port (RP) is provided in the framework of a call initiated from the external terminal device (KE1) to a further terminal device or from the further terminal device to the external terminal device (KE1).

15. Arrangement according to claim 13 or 14, characterized in that the further terminal device is an internal terminal device or an external terminal device.

Abstract

Network Switching Unit for a Communication System

By means of a network switching unit (IGATE) fashioned as subscriber line assembly in a communication system (PBX), data can be communicated with the communication system (PBX) between networks of different topology (data, communication network) connected to the network switching unit (IGATE). To that end, the network switching unit (IGATE) comprises a unit (BW-R) for the evaluation of routing information taken from the communicated data, a unit (VM-R) for the destination-oriented communication of the data dependent on the evaluation result, and a unit (KV-R) for the format-suited adaptation of the data.

Figure 2

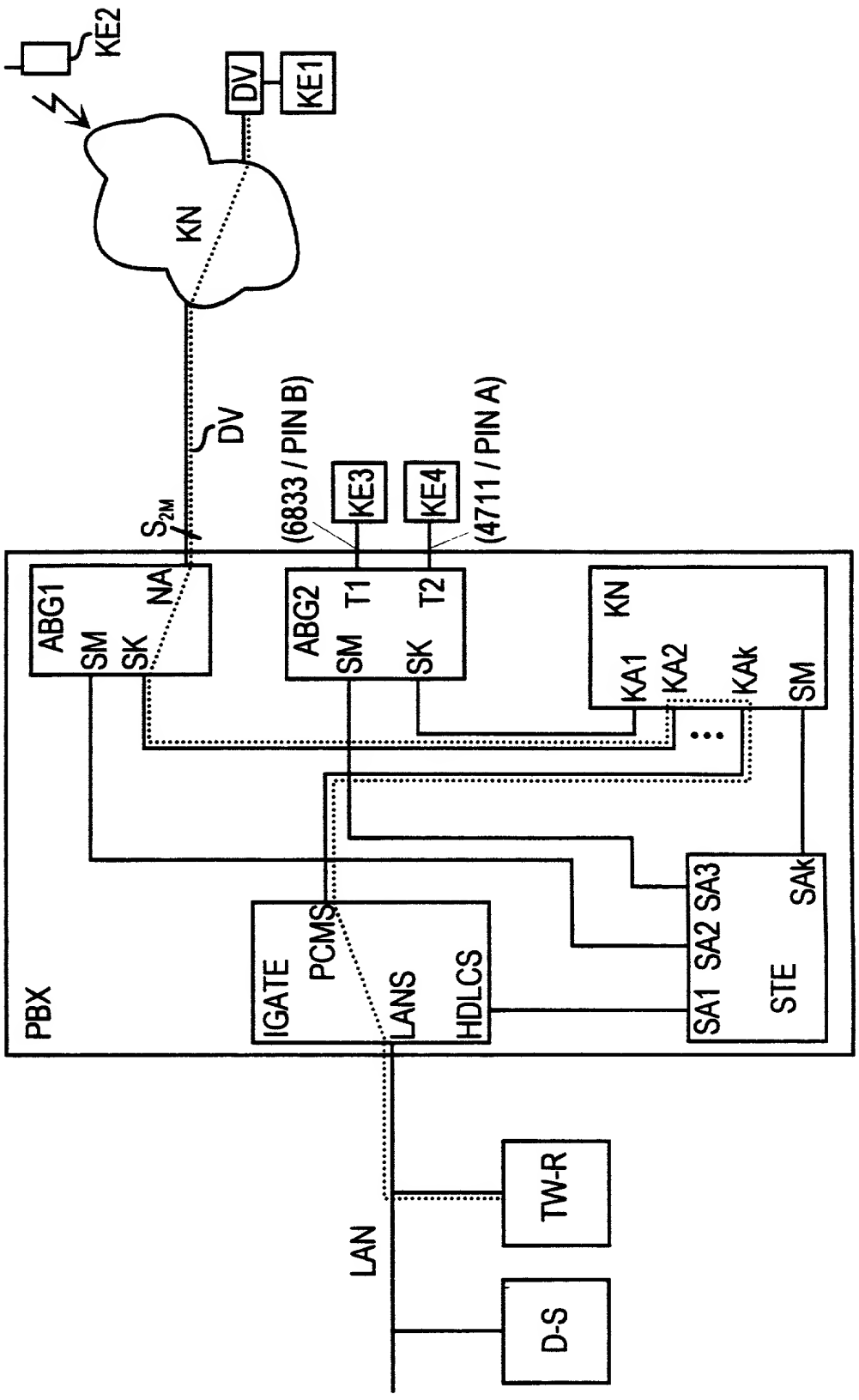
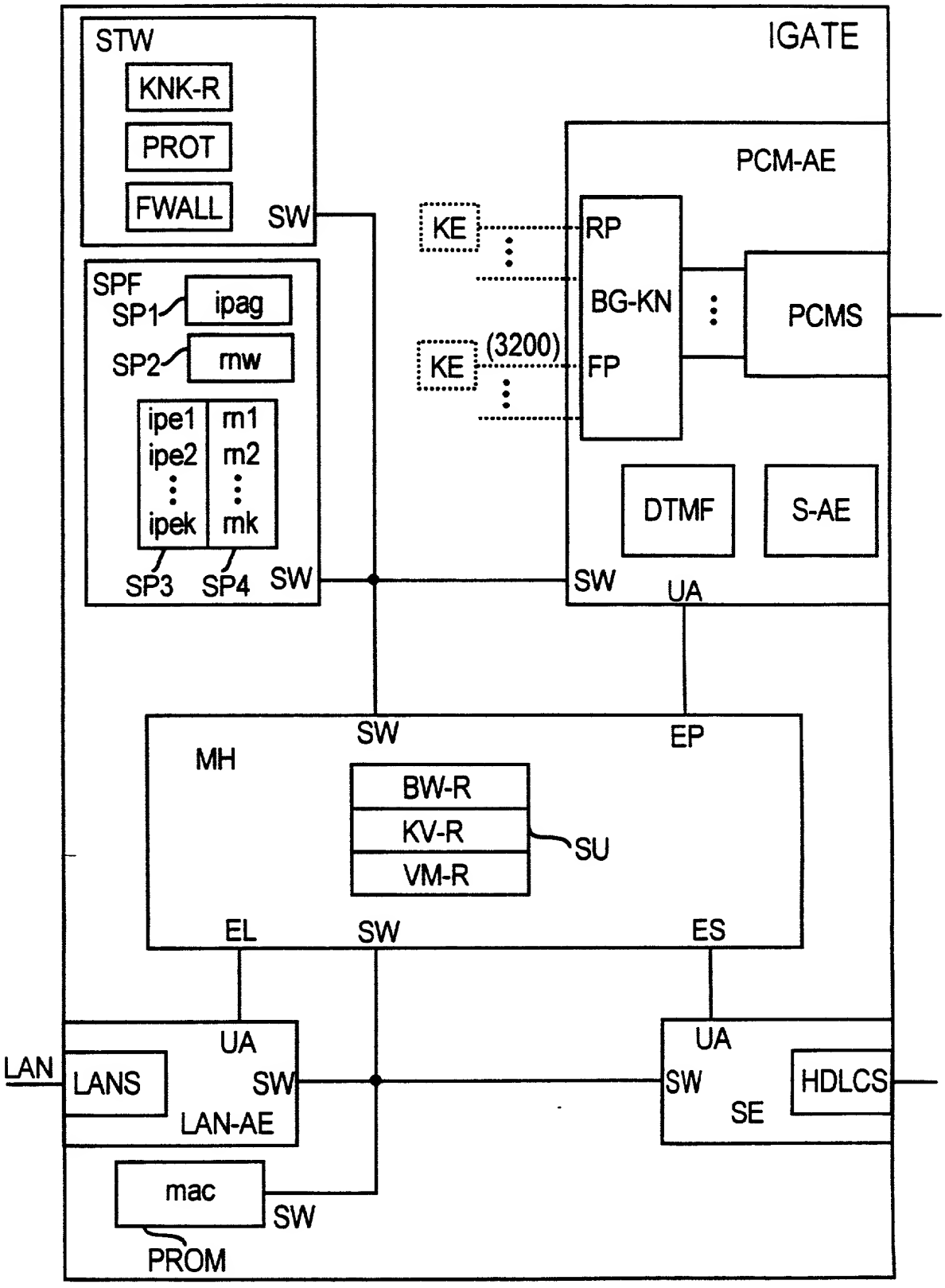

KE2
DV
KE1
KN
DV
S_{2M}
(6833 / PIN B)
KE3
KE4
(4711 / PIN A)
ABG1
SM
SK
NA
ABG2
SM
T1
SK
T2
KN
KA1
KA2
KAk
SM
PBX
IGATE
PCMS
LANS
HDLCS
SA1
SA2
SA3
SAk
STE
LAN
TW-R
D-S

Fig 1

Fig 2


IGATE
STW
KNK-R
PROT
FWALL
SW
SPF
SP1
ipag
SP2
rnw
ipe1
ipe2
ipek
rn1
rn2
rnk
SP3
SP4
SW
PCM-AE
KE
RP
BG-KN
KE
(3200)
FP
PCMS
DTMF
S-AE
SW
UA
SW
EP
MH
BW-R
KV-R
VM-R
SU
EL
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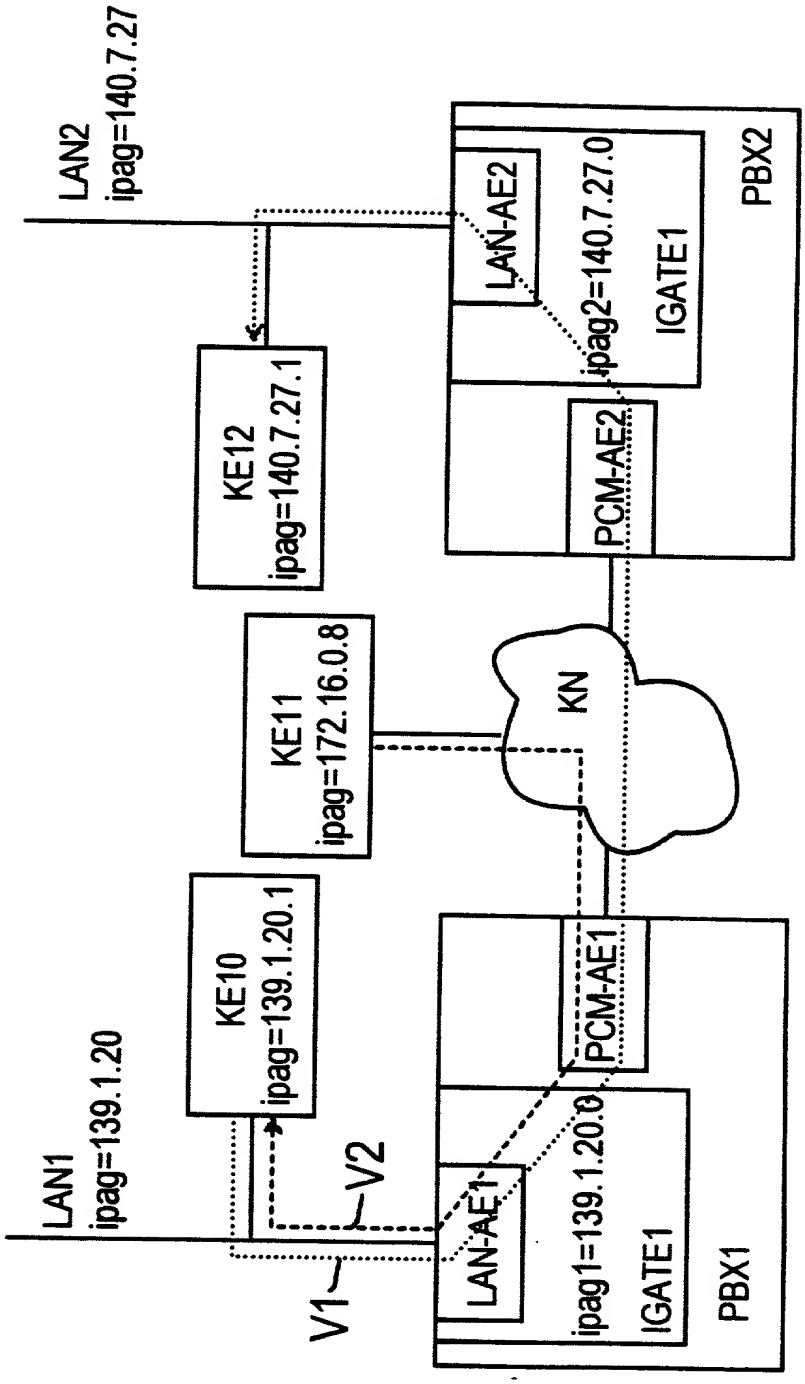
ES
UA
LAN
LANS
SW
LAN-AE
UA
SW
HDLCS
SE
mac
SW
PROM

Fig 3


LAN2
ipag=140.7.27
LAN-AE2
ipag2=140.7.27.0
IGATE1
PBX2
PCM-AE2
KE12
ipag=140.7.27.1
KE11
ipag=172.16.0.8
KN
KE10
ipag=139.1.20.1
LAN1
ipag=139.1.20
V2
V1
LAN-AE1
PCM-AE1
ipag1=139.1.20.0
IGATE1
PBX1

NETWORK SWITCHING UNIT FOR A COMMUNICATION SYSTEM

As a result of an increasing flexibility of the working conditions in terms of time and space, the number of those employees who do not perform their professional duties at their work station in the company is constantly increasing. It is known from "Das virtuelle Büro, telcomreport, No. 4, 1997, Siemens AG Berlin and Munich, that, on the one hand, an access to the local data resources of the company (also called 'remote LAN' in the literature) and, on the other hand, an access onto the communication performance features offered in the local communication network of the company (also called 'remote PBX' in the literature) regardless of the location of the employee are needed for an efficient handling of the tasks outside the company. Included among the performance features in addition to the standard performance features in, for example, an ISDN-oriented communication network are, for example, setting up a conference circuit or signalling when a message is received.

International Published Application WO 97/18662 discloses, for example, an arrangement wherein an external subscriber is connected via a public communication network to a "virtual presence server" allocated to a company. This "virtual presence server" controls the access of the external subscriber -- for the purpose of teleworking -- both to a communication system as well as to a local network of the company.

In current communication systems, for example, connection possibilities to a communication network brought to the communication system are realized by primary multiplex access units arranged therein that are also referred to as S_{2M} accesses. The communication network can, for example, be realized by an ISDN-oriented communication network (Integrated Service Digital Network). For access to a local data network, for example an Ethernet-LAN (Local Area Network) connecting a plurality of personal computers, via the ISDN-oriented communication network, a connection between the ISDN-oriented communication network and the local data network is realized via an external network switching unit -- often referred to as 'router' in the literature -- connected to a further S_{2M} access. To that end, the 'router' is equipped both with an S_{2M} interface as well as with a standard LAN interface,

whereby the S_{2M} interface is connected to the output of the S_{2M} access unit of the communication system and the LAN interface of the 'router' is connected to the local data network.

In view of its critical function, a 'router' realizes the layer 3 (switching layer) of the OSI reference model (Open Systems Interconnection), whereby networks with respectively different topology of the layers 1 (bit transmission layer) and 2 (protection layer) are physically connected with the assistance of a 'router' -- for example, Ethernet-LAN and ISDN-oriented communication network. In order to route data packets between the networks connected to a 'router', the address particulars -- destination and source address -- contained in routing information of the data packets are interpreted and evaluated by a control means located in the 'router'. Subsequently, the data packets are converted protocol-suited for a transmission.

Such an apparatus is known, for example, from Blitz, A. et al., "Integrating LAN, H-Channels and ATM into PBX technology", Proceedings of the International Switching Symposium (ISS '97), Toronto, Canada, 21-26 September 1997, Vol. 2, pages 573-579, XP000704513, with which a connection of a narrowband -- for example, ISDN-oriented -- communication system to a broadband local network is realized for a bidirectional data communication.

In order to be able to make the performance features realized by the communication network and offered at internal subscriber terminals available at an external terminal device, for example a terminal device connected to the communication system via an ISDN-oriented communication network, in the same way as at an internal terminal device -- as intended in the framework of 'teleworking' –, German Patent Application bearing Serial Number P19808368.8 has already disclosed that terminal device-oriented signalling information as are usually transmitted between the communication system and internal terminal devices connected thereto in the course of a signalling protocol be communicated between the communication system and the external terminal device via a further payload data connection (for example, a second ISDN-oriented B-channel) established in addition to the payload data connection (for example, a first ISDN-oriented B-channel).

The external terminal device is connected via the further payload data connection to a computer (often referred to as 'teleworking server' in the literature) connected to the local data network that controls the transmission of the terminal device-oriented signalling information between the communication system and the external terminal device. A conversion of the data format of the payload data connection, for example the data format of an ISDN-oriented B-channel, onto the data format of the local data network thereby ensues in an external 'router'.

In general, an S_{2M} interface comprises, first, 30 payload data channels that are fashioned as ISDN-oriented B-channels with a transmission rate of 64 kbit/s and, second, a signalling channel that is fashioned as ISDN-oriented D-channel with a transmission rate of 64 kbit/s. This means that the S_{2M} interface for the connection of the external 'router' is only optimally utilized given larger local data networks. Given smaller local data networks, the payload data channels of the S_{2M} interface are

A further advantage of the inventive network switching unit is comprised therein that, due to the implementation of the system components needed for a router function and those needed for a 'teleworking' function on a common assembly, only one payload data connection (instead of two payload data connections) for communicating payload data and terminal device-oriented signalling information between the external terminal device and the network switching unit need be set up for offering the performance features realized by the communication system at an external terminal device via a communication network.

Advantageous developments of the invention are indicated in the subclaims.

Due to the arrangement of a DTMF recognition unit and of an output unit for stored voice messages or, respectively, text messages on the network switching unit, the performance features realized by the comm system can also be offered at arbitrary external terminal devices -- and not only a terminal devices configured for 'teleworking'.

An exemplary embodiment of the invention is explained in greater detail below on the basis of the drawing.

Thereby shown are:

Figure 1 a structural image for the schematic illustration of a communication system with a network switching unit arranged therein;

Figure 2 a structural image for the schematic illustration of the critical function units of the network switching unit;

Figure 3 a structural image for the schematic illustration of two communication systems according to Figure 1 arranged in a communication network.

Figure 1 shows a schematic illustration of a communication system PBX with a network switching unit IGATE arranged therein and configured as subscriber line unit. The communication system PBX comprises further subscriber or, respectively, line units - a first and second line unit ABG1, ABG2 are shown by way of example - for connection of communication terminal devices or, respectively, for a connection to further communication systems arranged in a communication network KO. Further, the communication system PBX contains a switching network module

KN comprising a plurality of bidirectional, time-division multiplex-oriented switching terminals KA1,...KAk, whereby the time-division multiplex-oriented switching terminals KA1,...,KAk are configured as PCM terminals (pulse code mode modulation) - also referred to as PCM highways, speech highways or S_{2M} connections. Each PCM highway comprises, first, thirty payload channels that are fashioned as ISDN-oriented B-channels (integrated services digital network) with a transmission rate of 64 kbits/s and, second, comprises a signaling channel that is fashioned as ISDN-oriented D-channel with a transmission rate of 64 kbit/s. Via the switching terminal KAk, the switching network module KN is connected to a bidirectional, time-division multiplex-oriented PCM interface PCMS of the network switching unit IGATE. Via the further PCM terminals KA1, KA2, the switching network module KN is respectively connected to a bidirectional, time-division multiplex-oriented terminal SK of the first and of the second line unit ABG1, ABG2.

Further, a control unit STE comprising a plurality of control terminals SA1,..SAk is arranged in the communication system PBX. The control unit STE is connected to a control input SM of the switching network module KN via a control terminal SAk. Via the further control terminals SA1,...SA3, the control unit STE is connected, first, to an HDLC interface HDLCS arranged at the network switching unit IGATE and, second, is connected to control terminals SM of the first and of the second line unit ABG1, ABG2.

A communication network KO - for example, an ISDN-oriented communication network - composed of a plurality of communication systems connected to one another is connected to a network terminal NA - for example, a bidirectional, time-division multiplex-oriented S_{2M} terminal - of the first line unit ABG1. A first external terminal device KE1 having a data processing means DV that, for example, is fashioned as personal computer or as insert card for an existing terminal device, and a second external terminal device KE2 are connected to the communication network KO. A first internal terminal device KE3 having the communication system-internal telephone number 6833 is connected to a first subscriber terminal T1 - for example, to an S_0 terminal (2B + D, i.e. 2 ISDN-oriented payload channels and one ISDN-oriented signaling channel) of the second line unit

ABG2, and a second internal terminal device KE4 having a communication system-internal telephone number 4711 is connected to a second subscriber terminal T2.

A local network LAN, for example, an Ethernet-LAN (local area network) - is connected via an LAN interface LANS to the network switching unit IGATE. A plurality of computers D-S, TW-R, for example "personal computers" or "multi-media workstations", are connected to one another by the local network LAN.

Figure 2 shows a schematic illustration of the critical function units of the network switching unit IGATE. The network switching unit IGATE comprises an LAN access unit LAN-AE with an LAN interface, whereby the LAN interface LANS can be connected to the local network LAN. The network switching unit IGATE further comprises a PCM line unit PCM-AE having a bidirectional, time-division multiplex-oriented PCM interface PCMS, whereby the PCM interface PCMS can be connected to the switching terminal KAk of the switching network module KN of the communication system PBX. Further, the PCM line unit PCM-AE comprises an assembly switching network module BG-KN connected to the PCM interface PCMS. A DTMF recognition unit DTMF and an output unit S-AE are also arranged in the PCM line unit PCM-AE. The DTMF recognition unit DTMF serves the purpose of recognizing and evaluating control information in the form of DTMF signals received via a payload data connection conducted via the PCM interface PCMS. The output unit S-AE served for communicating stored voice messages to an external terminal device KE2 via a payload data connection.

Further, a signaling unit SE having an HDLC interface HDLCS is arranged at the network switching unit IGATE. Via the HDLC interface HDLCS, the signaling unit SE is connectible to the control terminal SAE of the control unit STE of the communication system PBX. The LAN line unit LAN-AE, the PCM line unit PCM-AE and the signaling unit SE are respectively connected via a terminal UA to a terminal EL, EP, ES of a conversion unit MH arranged at the network switching unit IGATE.

The conversion unit MH comprises a control unit SU. With the assistance of the control unit SU, data communicated to the network switching unit IGATE or, respectively, to the LAN line unit LAN-AE or the PCM line unit PCM-AE or the

signaling unit SE are communicated between the local network LAN and the payload data channels of the communication network KO brought to the network switching unit IGATE.

To this end, the control unit SU of the conversion unit MH comprises an evaluation unit BW-R for evaluating routing information - i.e. destination and source data - contained in data to be communicated and also comprises a switching unit VM-R for communicating the data from and to the local network LAN or, respectively, from and to the communication network KO dependent on the evaluation result. Further, signaling information are converted protocol-suited by a conversion unit KV-R of the control unit SU. To that end and given data to be communicated to the local network LAN, the signaling information incoming at the signaling unit SE are converted into corresponding routing information, and the payload data incoming at the PCM line unit PCM-AE together with the routing information that have been formed are converted into format-suited data, i.e. data adapted to the LAN format, and are communicated to the LAN line unit LAN-AE.

For an exchange of data between the local network LAN connected to the network switching unit IGATE and the communication network KO, the LAN line unit LAN-AE or, respectively, the LAN interface LANS has an unambiguous identification or, respectively, address allocated to it, i.e. an identification or, respectively, address that is valid worldwide. Since the applications that realize the data exchange - for example, a software module realizing data exchange - are resident on different levels of the OSI reference model, a plurality of identifications or, respectively, addresses valid on different levels of the OSI reference model are allocated to the LAN line unit LAN-AE. Thus, an unambiguous, assembly-specific LAN identification mac is allocated to the LAN line unit LAN-AE. The assembly-specific LAN identification mac realizes a hardware address of the LAN interface LANS resident on layer 1 of the OSI reference model and is stored in a non-volatile memory PROM arranged at the network switching unit IGATE.

Additionally, an unambiguous, logical network identification or, respectively, network address ipag is allocated to the LAN line unit LAN-AE. This is four bytes long and represents an address of the layer 3 of the OSI reference model -

for example, an Internet protocol address. The logical network identification ipag identifies both the LAN line unit LAN-AE as well as the local network LAN connected to the LAN line unit LAN-AE. The logical network identification ipag is stored in a memory area SP1 of a volatile memory SPF arranged at the network switching unit IGATE.

The network switching unit IGATE additionally comprises a control unit STW that comprises a protocol unit PROT and a filter unit FWALL. The control STW is connected via control terminals SW to the LAN line unit LAN-AE, to the PCM line unit PCM-AE, to the signaling unit SE of the conversion unit MH and to the memories PROM and SPF. The communication of data to be communicated between the local network ALN, the communication network KO and terminal devices KE3, KE4 internally connected to the communication system PBX is realized by the protocol unit PROT. Realized in the protocol unit PROT are, first, the Internet-specific protocols TCP/IP (transmission control protocol/Internet protocol), H. 323 as well as the PPP protocol (point-to-point protocol) designed for the transport of TCP/IP data packets and of H.323 data packets via a point-to-point connection, and the H.320 protocol conceived for a transmission of voice and data via an ISDN-oriented connection.

A security-oriented decoupling of the networks LAN, KN connected to the network switching unit IGATE is realized by the filter unit FWALL. As a result of the filter function realized in the filter unit FWALL, a data access from the local network LAN onto a potentially further communication system-internal local network is checked for authorization, as is a data access via the communication network KO to the local network LAN as well. For the realization of the filter functions, both the source as well as destination addresses contained in the routing information of the data to be communicated are checked for allowability (this check is often referred to as source and destination checking in the literature). When checking the source address and given a connection setup initiated via the communication network KO, the telephone number of the calling communication terminal device is checked on the basis of a list (not shown) with predetermined, authorized telephone numbers (is often referred to as subscriber authentification in the literature) and, thus, inadmissible

connections via the communication network KO are prevented. Further, the logical network identification ipag of data packets incoming at the LAN line unit LAN-AE are checked. When the source address is authorized for the exchange of data via the network switching unit IGATE, the destination address contained in the routing information is checked according to said criteria. Additionally, an authentification check of the source address can be implemented on the basis of the protocols PAP (password authentification protocol) and CHAP (challenge handshake authentification protocol) provided in the framework of the PPP protocol.

After the data have successfully run through the filter functions, i.e. after confirming the authorization of the data exchange between the communication terminal devices identified by the source and destination address, the destination address or, respectively, logical network identification ipag contained in the data are evaluated by the routing functions realized on the network switching unit IGATE or, respectively, at the conversion unit MH and the protocol unit PROT. When the local network LAN is identified by the logical network identification ipag, the data are correspondingly switched in said way via the conversion unit UE.

The volatile memory SPF also comprises a third memory area SP3 for storing logical destination network identifications ipe1,...ipek of further communication systems arranged in the communication network or, respectively, of the local network connected thereto that are provided for a data exchange with the local network LAN or, respectively, with the communication terminal devices connected to the local network LAN. To this end, a communication network identification rn1,...rnk respectively representing a telephone number of corresponding network switching units arranged in the further communication systems are stored in a fourth memory area SP4 of the volatile memory SPF allocated to the third memory area SP3. At least one communication network identification rn1,..rnk is allocated to every logical destination network identification ipe1,...,ipek stored in the third memory area SP3. Given data to be communicated to a communication system arranged in the communication network KO, the further conversion unit KVK-R arranged in the control unit STW of the network switching unit IGATE determines the corresponding logical destination network identification

ipe1,...,ipek stored in the third memory area SP3, and a corresponding payload data connection is setup via the communication network KO on the basis of the allocated communication network identification in1,...,ink stored in the fourth memory area SP4.

So that further communication systems arranged in the communication network KO can set up a corresponding payload connection to the communication system PBX or, respectively, to the network switching unit IGATE, an unambiguous communication network identification rnw is allocated to the network switching unit IGATE, this being stored in a second memory SP2 of the volatile memory SPF.

The exchange of data between local networks LAN1, LAN2 connected to a network switching unit IGATE1, IGATE2 and between a local network LAN1 and an external terminal device KE11 connected to a communication network KO shall be explained in greater detail on the basis of the structogram shown in Figure 3. The structogram schematically shows two communication systems PBX1, PBX2 arranged in a communication network KO and configured according to Figure 1. The two communication systems PBX1, PBX2 are connected via a PCM line unit PCM-AE1, PCM-AE2 to the communication network KO. Both communication systems PBX1, PBX2 comprise a network switching unit IGATE1, IGATE2 according to Figure 2.

The network switching unit IGATE1 arranged in the first communication system PBX1 comprises a first LAN line unit LAN-AE having an LAN interface (not shown). The first LAN line unit LAN-AE1 has a logical network identifier ipag1 = 139.1.20.0 allocated to it that is four bytes long. The network switching unit IGATE2 arranged in the second communication system PBX2 comprises a second LAN line unit LAN-AE2 having an LAN interface (not shown). The second LAN line unit LAN-AE2 has a logical network identification ipag2 = 140.7.27.0 allocated to it. Below, only logical network identifications ipag or, respectively, the Internet protocol addresses allocated to the individual units or local networks shall be considered, i.e. the transport realized in the layers 3 and 4 of the OSI reference model or, respectively, the exchange of data packets controlled by the TCP/IP protocols arranged therein shall be explained in greater detail.

A first local network LAN1 is connected to the first LAN line unit LAN-AE1, a communication terminal device KE10 being connected via said first local network LAN1 to the network switching unit IGATE1 or, respectively, to the first communication system PBX1. The logical network identification, i.e. the standardized Internet protocol address, is structured according to version 4, i.e. it comprises four bytes. The local network can thereby be unambiguously identified by the addressing information covering the first three bytes; the communication terminal KE10 in the local network can be identified by the addressing information covering the last byte. Due to the allocation of the Internet protocol address ipage1 = 139.1.20.0 to the first LAN line unit LAN-AE1, both the first LAN line unit LAN-AE1 as well as the first local network LAN1 connected thereto are identified by the first three bytes ipag = 139.1.20. Correspondingly, the communication terminal device KE10 connected to the first local network LAN1 exhibits the Internet protocol address ipag = 139.1.20.1.

A second logical network LAN2 is connected to the second LAN line unit LAN-AE2, a communication terminal device KE12 being connected via said second local network LAN2 to the network switching unit IGATE2 or, respectively, to the second communication system PBX2. The second local network LAN2 connected to the second LAN line unit LAN-AE2 has the Internet protocol address ipag = 140.7.27 allocated to it. The communication terminal device KE12 connected to the second local network LAN2 correspondingly comprises the Internet protocol address ipag = 140.7.27.1. Further, an external communication terminal device KE11 that exhibits the Internet protocol address ipag = 172.16.0.8 is connected to the communication network KO.

Given data - indicated by a dotted line V1 - to be communicated from the communication terminal device KE10 connected to the first communication system PBX1 to the communication terminal device KE12 connected to the second communication system PBX2, these exhibit the Internet protocol address ipag = 139.1.20.1 as source address and the Internet protocol address ipag = 140.7.27.1 as destination address. On the basis of the destination address and with the assistance of the evaluation and switching units KNK-R, VM-R arranged at the network switching

unit IGATE1, the telephone number of the network switching unit IGATE2 arranged in the second communication system PBX2 is identified and a corresponding payload data connection is setup to the network switching unit IGATE2 addressed on the basis of the telephone number. According to the destination address ipag = 140.7.27.1, the evaluation and switching units BW-R, VM-R arranged at the network switching unit IGATE2 communicate the communicated data packets to the second local network LAN2 or, respectively, to the communication terminal device KE12.

Given data - indicated by a broken line V2 - to be communicated from the external communication terminal device KE11 connected to the communication network KO to the communication terminal device KE10 connected to the first communication system PBX1, a payload data connection between the external communication terminal device KE11 and the network switching unit IGATE1 arranged in the first communication system PBX1 is setup in a first step on the basis of the telephone number of the network switching unit IGATE1 in the first communication system PBX1. The communicated data have the Internet protocol address ipag = 172.16.0.8 as source address and the Internet protocol address ipag = 139.1.20.1 as destination address. The communicated data packets are communicated according to the destination address ipag = 139.1.20.1 to the first local network LAN1 or, respectively, to the communication terminal device KE10 by the evaluation and switching units BW-R, VM-R arranged at the network switching unit IGATE1.

The collaboration of the critical system components needed for a "teleworking" shall be explained in greater detail below on the basis of Figures 1 and 2.

For offering performance features realized by the communication system PBX and available at internal subscriber terminals T1, T2 at an external communication terminal device connected to the communication network KO and configured for a "teleworking", terminal device-oriented signaling information that are based on a signaling protocol Cornet-TS as usually available in the signaling exchange between internal terminal devices KE3, KE4 and the communication system PBX are communicated between the external communication terminal device and the communication system PBX. The communication of the terminal device-oriented

simultaneously redirected to the fictitious terminal port FP of the network switching u nit IGATE.

Additionally, all terminal device-oriented signaling information (assuming the log-on of the first external terminal device KE1 at the communication system PBX with the internal communication system telephone number of the second internal terminal device KE4) to be communicated from the control unit STE of the communication system PBX to the second internal terminal device KE4 (internal communication system telephone number 4711) are redirected to the fictitious terminal port FP (with the internal communication system telephone number 3200) of the network switching unit IGATE. The terminal device-oriented signaling information are communicated from the control unit STE of the communication system PBX to the network switching unit IGATE, which communicates them to the first external terminal device KE1 in the way described above.

By communicating terminal device-oriented signaling information based on the signaling protocol Cornet-TS to the first external terminal device KE1, all performance features realized by the communication system PBX are made available to the first external terminal device KE1 in the same way they are made available to the second internal terminal device KE4. A communication of terminal device-oriented signaling information from the first external terminal device KE1 - assuming the log-on thereof at the communication system PBX - to the control unit STE of the communication system PBX ensues in the same way in the opposite direction.

Given a connection setup - which, for example, ensues by lifting up the receiver at the first external terminal device KE1 - initiated by the first external terminal device KE1 - assuming the log-on thereof at the communication system PBX - to a further (internal or external) terminal device - for example, to the first internal terminal device KE3 -, a connection setup message is communicated via the payload data connection DV to the teleworking computer TW-R. The teleworking computer TW-R forwards a connection setup message for the fictitious terminal port FP of the network switching unit IGATE to the control unit STE of the communication system PBX. In response thereto and in a first step, the control unit STE of the communication system PBX sets up a sub-connection between the fictitious terminal

port FP of the network switching unit IGATE and the switching network module KN of the communication system PBX by occupying a free payload channel of the PCM highway that connects the network switching unit IGATE to the switching network module KN.

In a next step, the teleworking computer TW-R communicates a readiness message to the first external terminal device KE1 via the payload data connection DEV. In response thereto, the first external terminal device KE1 sends the telephone number allocated to the first external terminal device KE1 in the communication network KO to the teleworking computer TW-R in a reply message. In a further step, a further sub-connection to the first external terminal device KE1 is setup from a further fictitious terminal port RP of the network switching unit IGATE (often referred to as "remote port" in the literature). After the switching of the sub-connection to the further sub-connection in the assembly switching network module BG-KN of the network switching unit IGATE, a dial tone sounds at the first external terminal device KE1 (signaling the readiness to input dial information).

The dial information - for example, 6833 for the first internal terminal device KE3 - input in response thereto at the first external terminal device KE1 are communicated via the payload connection DV to the network switching unit IGATE and are forwarded from the latter to the control unit STE of the communication system PVX. Subsequently, a terminal device connection between the first internal terminal device KE3 and the first external terminal device KE1 is setup by the control unit STE of the communication system PBX.

Given a connection setup to the second internal terminal device KE4 proceeding from a further (external or internal) terminal device - assuming the log-on of the first external terminal device KE1 with the internal communication system telephone number of the second internal terminal device KE4 - , a sub-connection between the further terminal device and the fictitious terminal port FP of the network switching unit IGATE is setup by the communication system PBX on the basis of the activated call redirection for the second internal terminal device KE4. In a next step, the teleworking computer TW-R communicates a readiness message to the first external terminal device KE1 via the payload connection DV. The first external

terminal device KE1 subsequently sends the telephone number allocated to the first external terminal device KE1 in the communication network KO to the teleworking computer TW-R in a reply message. In a further step, a further sub-connection to the first external terminal device KE1 is setup proceeding from a further fictitious terminal port RP of the network switching unit IGATE. In a final step, the sub-connection and the further sub-connection are coupled in the assembly switching network module BG-KN of the network switching unit IGATE, as a result whereof the terminal device connection between the first external terminal device KE1 and the further terminal device arises.

A communication of the voice and of the terminal device-oriented signaling information between the network switching unit IGATE and the first external terminal device KE1 ensues with H.323 data packets on the basis of the PPP protocol. With the assistance of the H.323 protocol, the terminal device-oriented signaling information to be communicated and the voice are compressed and converted into data packets based on the TCP/IP protocol.

After the end of the terminal device connection existing between the first external terminal device KE1 and the further terminal device, the further fictitious terminal port RP of the network switching unit IGATE is released by the teleworking computer TW-R and is thus available for a new connection setup between an arbitrary terminal device logged on at the communication system PBX and a further terminal device. In contrast thereto, the fictitious terminal port FP of the network switching unit IGATE remains allocated to the first external terminal device KE1 and is only released after a log-off of the first external terminal device KE1 initiated by the subscriber. After the log-off and due to the deactivation of the call redirection at the communication system PBX, the terminal device-oriented signaling information to be communicated to the subscriber by the control unit STE of the communication system PBX are communicated to the terminal port of the internal terminal device allocated to the subscriber - for example, at the terminal port of the second internal terminal device KE 4 having the internal communication system telephone number 4711.

For offering performance features realized by the communication system PBX and available at internal subscriber terminals T1, T2 to an arbitrary external

communication terminal device connected to the communication network KO, control information in the form of DTMF signals (dual tone multi-frequency) are communicated from the external terminal device to the network switching unit IGATE via a voice connection. For the DTMF signals, a characteristic signal is allocated to each key of a terminal device, this being communicated via the voice connection when the key is actuated. The signal differs in frequency and signal duration from the data usually communicated via the voice connection, so that the signals can be identified and interpreted at the network switching unit IGATE.

The external terminal device can be connected to the communication system via an arbitrary communication network, for example an analog communication network, an ISDN-oriented communication network or a radio telephone network. The demands made of the external terminal device are merely comprised therein that the MFV dial method (multi-frequency dial method) for generating DTMF signals is supported by the external terminal device.

For a log-on of the second external terminal device KE2 at the communication system PBX, a subscriber inputs, for example, a "teleworking" telephone number at the second external terminal device KE2. In response thereto, a voice connection is setup between the second external terminal device KE2 and the network switching unit IGATE.

For an identification of the second external terminal device KE2 at the communication system PBX, the output unit S-AE arranged at the network switching unit IGATE communicates a first, recorded voice message to the second external terminal device KE2 that prompts the subscriber to input the telephone number allocated to the second external terminal device KE2 in the communication network KO - referred to below as manual identification. Additionally, a second recorded voice message is communicated from the output unit S-AE to the second external terminal device KE2 for an authentification of the subscriber, this prompting the subscriber to input a personal identification number PIN. These identification and authentification data communicated in the form of DTMF signals via the voice connection are interpreted by the DTMF recognition unit DTMF and are forwarded via the LAN line unit LAN-AE to the teleworking computer TW-R. The teleworking

computer TW-R enters the second external terminal device KE2 as being identified, for example with an entry of the second external terminal device KE2 in a list (not shown) insofar as this was not already carried out in an earlier identification.

As result of the identifier PIN communicated in the authentification data, that internal subscriber terminal port of the communication system PBX via which the subscriber would like to log on at the communication system PBX is identified on the basis of a list (not shown) stored in the teleworking computer TW-R. When the identifier PIN A is communicated during the framework of the authentification, for example, then a log on of the second external terminal device KE2 ensues for the second internal terminal device KE4. Additionally, the subscriber can be requested to communicate a personal password.

When the telephone number allocated to the second external terminal device KE2 in the communication network KO - for example, in the framework of an ISDN connection (in the framework of the performance feature "calling party number") - was automatically communicated from the second external terminal device KE2 to the network switching unit IGATE - also referred to below as automatic identification - , a check is carried out in the teleworking computer TW-R to see whether the second external terminal device KE2 has already been identified, i.e. whether an entry for the second external terminal device KE2 is already present in the list. When the second external terminal device KE 2 has not yet been identified, the output unit S-AE of the network switching unit IGATE communicates the second recorded voice message to the second external terminal device KE2, this prompting the subscriber to input the personal identifier PIN and/or the personal password.

Alternatively, the identifier PIN communicated by the subscriber can be allocated to a fictitious terminal port of the communication system PBX. Subscribers to whom no physically existing internal terminal device is allocated can thus also use the performance features of the communication system PBX at the external terminal device.

A check of the log-on of the second external terminal device KE2 occurs on the basis of a list (not shown) stored in the teleworking computer TW-R that contains the internal communication system telephone numbers or, respectively,

identifiers PIN authorized for the "teleworking". When the check has confirmed the log-on, a fictitious terminal port - for example, the fictitious terminal port FP having the communication system - internal telephone number 3200 - of the network switching unit IGATE is allocated to the second external terminal device KE2 by the teleworking computer TW-R. At the same time and due to the activation of the performance feature "call redirection" realized by the communication system PBX, all calls directed to the internal subscriber terminal port (for example, the second subscriber terminal T2 of the second line unit ABG2 with the internal communication system telephone number 4711) identified by the internal communication system telephone number of, respectively, by the identifier PIN are redirected to the fictitious terminal port FP of the network switching unit IGATE.

When, following the log-on, the voice connection is interrupted, for example by hanging up the receiver at the second external terminal device KE2 (this corresponds to the normal case), then a renewed identification (communication of the telephone number allocated to the second external terminal device KE2 in the communication network KO) of the second external terminal device KE2 at the communication system PBX is necessary in order to setup a new voice connection to the network switching unit IGATE. Additionally, the authentification data must be re-transmitted in the framework of the manual identification.

Assuming the log-on of the second external terminal device KE2 at the communication system PBX with the internal communication system telephone number or, respectively, identifier of the second internal terminal device KE4, the control unit STE of the communication system PBX additionally redirects terminal device-oriented signaling information to be communicated to the second internal terminal KE4 to the fictitious terminal port FP of the network switching unit IGATE. In the above-described way, the control unit STE of the communication system PBX communicates the terminal device-oriented signaling information to the teleworking computer TW-R via network switching unit IGATE.

In the teleworking computer TW-R, a message (for example, a terminal device-oriented signaling information) communicated from the control unit STE of the communication system PBX to the fictitious terminal port FP is evaluated, and, in

instances wherein this message is to be forwarded to the second external terminal device KE2, is converted into a voice message corresponding to the terminal device-oriented signaling information. The voice message is subsequently communicated via a newly established voice connection to the second external terminal device KE2 and is output thereat, for example via a loudspeaker. Further, there is the possibility of communicating messages corresponding to the terminal device-oriented signaling information to SMS-compatible terminal devices (short message service), particularly radio terminal devices. To this end, a message is communicated to the appertaining "network provider", who communicates the corresponding text message to the terminal device at which the text message is output, for example at a display.

When, proceeding from a further (external or internal) terminal device, a connection setup to the second internal terminal device KE4 is initiated - assuming the log-on of the second external terminal device KE2 at the communication system PBX with the internal communication system telephone number or, respectively, identifier of the second internal terminal device KE4 -, a sub-connection between the further terminal device and the fictitious terminal port FP of the network switching unit IGATE is setup due to the activated call redirection. In a further step, a further sub-connection between a further fictitious terminal port RP of the network switching unit IGATE and the second external terminal device KE2 is setup on the basis of the telephone number of the second external terminal device KE2 in the communication network KO communicated in the identification data. In a final step, the sub-connection and the further sub-connection are coupled in the assembly switching network module BG-KN of the network switching unit IGATE, as a result whereof a terminal device connection between the second external terminal device KE2 and the further terminal device arises.

Given a connection setup initiated by the second external terminal device KE2 to a further (internal or external) terminal device, a voice connection to the further fictitious terminal port RP of the network switching unit IGATE is setup on the basis of a renewed input of the "teleworking" telephone number. After a communication of the identification data via the voice connection, the output unit S-AE of the network switching unit IGATE communicates a recorded voice message to

the second external terminal device KE2 that informs the subscriber about possible user actions such as, for example, output of a voice message stored in the communication system PBX or setup of a terminal device connection proceeding from the second external terminal device KE2 to a further terminal device. Due to the input of a significant key combination at the second external terminal device KE2, a control information corresponding to the key combination is communicated in the form of DTMF signals via the voice connection to the network switching unit IGATE that signals the communication system PBX that, proceeding from the fictitious terminal port FP of the network switching unit IGATE, a terminal device connection is to be setup to a further terminal device. Subsequently, the control unit STE of the communication system PBX sets up a sub-connection between the fictitious terminal port FP of the network switching unit IGATE and the switching network module KN of the communication system PBX by occupying a free payload channel of the PCM highway connecting the switching network module KN and the network switching unit IGATE.

After a coupling of the voice connection with the sub-connection in the assembly switching network module BG-KN of the network switching unit IGATE, the dial tone sounds at the second external terminal device KE2. The dial information subsequently input at the second external terminal device KE2 - for example 6833 for the first internal terminal device KE3 - are communicated to the network switching unit IGATE in the form of DTMF signals via the voice connection and this network switching unit IGATE forwards these to the control unit STE of the communication system PBX. Subsequently, the control unit STE of the communication system PBX sets up a terminal device connection between the second external terminal device KE2 and the first internal terminal KE3.

When there is the possibility at the second external terminal device KE2 of communicating the telephone number allocated to the second external terminal device KE2 in the communication network KO automatically to the network switching unit IGATE, for example in the framework of an ISDN connection (in the framework of the performance feature "calling party number"), then the subscriber can initialize a connection setup proceeding from the communication system PBX by inputting a

specific "teleworking" telephone number. The network switching unit IGATE recognizes on the basis of the specific "teleworking" telephone number that a terminal device connection to a further terminal device is to be setup from the second external terminal device KE2 and does not accept the call of the second external terminal device KE2. In a next step and proceeding from the communication system PBX, a connection proceeding from the further fictitious terminal port RP of the network switching unit IGATE is set up to the second external terminal device KE2 on the basis of the telephone number of the second external terminal device KE2 in the communication network KO automatically communicated in the framework of the ISDN connection, so that no charges for the terminal device connection to the further terminal device to be setup are incurred by the subscriber at the second external terminal device KE2.

The control information sent from the second external terminal device KE2 during a terminal device connection existing between the second external terminal device KE2 and a further terminal device are communicated to the network switching unit IGATE in the form of DTMF signals via the terminal device connection. The control information are identified at the network switching unit IGATE by the DTMF recognition unit DTMF and are forwarded to the teleworking computer TW-R. In the teleworking computer DW-R, the received control data are converted into terminal device-oriented signaling information, for example on the basis of a list (not shown). These converted terminal device-oriented signaling information are forwarded via the network switching unit IGATE to the control unit STE of the communication system PBX. If the control information communicated by the second external terminal device KE2 in the form of DTMF signals cannot be interpreted by the network switching unit IGATE, then the DTMF signals are forwarded to the further terminal device.

After the end of the terminal device connection existing between the second external terminal device KE2 and the further terminal device, the further fictitious terminal port RP of the network switching unit IGATE is released by the teleworking computer TW-R and is thus available for a new connection setup between an arbitrary terminal device logged on at the communication system PBX and a

3. Arrangement according to claim 1 or 2, characterized in that the switching unit (VM-R) comprises means for the communication of the data packets

-- between internal communication terminal devices (KE3, KE$) connected to the communication system (PBX) and the local network (LAN), and

-- between external terminal devices that are connected to further interconnected communication systems (KW1, KE2) forming a communication network and the local network (LAN).

4. Arrangement according to one of the preceding claims, characterized in that the communication network (KO) is a digital or an analog communication network.

5. Arrangement according to claim 4, characterized in that the communication network (KO) is a line-bound and/or a radio communication network.

6. Arrangement according to one of the preceding claims, characterized in that an LAN identifier information (mac) serving for the identification of the data network interface (LANS) within the local data network (LAN) is stored in a non-volatile memory (PROM) arranged on the network switching unit (IGATE);
a logical network identifier information (ipag) for identifying the data network interface (LANS) and communication terminal devices connected to the local data network (LAN) is stored in a first sub-area (SP1) of a memory arranged on the network switching unit (IGATE); and
a communication network identifier information (rnw) for the identification of the network switching unit (IGATE) within the communication network (KO) is stored in a second sub-area (SP2) of the memory (SPF).

7. Arrangement according to claim 6, characterized in that the LAN identifier information (mac) is an interface-related LAN address whose presence is standard;

the logical network identifier information (ipag) is an Internet protocol address whose presence is standard; and

the communication network identifier information (rnw) is a communication network telephone number.

8. Arrangement according to claim 6 or 7, characterized in that

further logical network identifier information (ipe1,...,ipek) of further local data networks are stored in a third sub-area (SP3) of the memory (SPF); and

further communication network identifier information (rn1, ..., rnk) are stored in a fourth sub-area (SP4) of the memory (SPF), whereby a further logical network identifier information (ipe1, ..., ipek) and a further logical communication network identifier information (rn1, ..., rnk) are respectively allocated to one another.

9. Arrangement according to claim 8, characterized in that, for the communication of data packets via the communication network (KO), the network switching unit (IGATE) comprises a further conversion unit (KNK-R) for converting the logical network identifier information (ipe1, ..., ipek) into a communication network identifier information (rn1, ..., rnk).

10. Arrangement according to one of the preceding claims, characterized in that the network switching unit (IGATE) comprises a security unit (FWALL) for checking the routing information communicated to the network switching unit (IGATE) in view of an admissibility for a communication connection between the source and destination means identified by an appertaining routing information.

11. Arrangement according to one of the preceding claims, characterized in that the network switching unit (IGATE) comprises a protocol unit (PROT) for protected and/or transmission protocol-conforming communication of data packets dependent on a selected transmission protocol.

BOX PCT
IN THE UNITED STATES DESIGNATED/ELECTED OFFICE
OF THE UNITED STATES PATENT AND TRADEMARK OFFICE
UNDER THE PATENT COOPERATION TREATY--CHAPTER II

APPLICANT(S):	KLAUS WEHREND
ATTORNEY DOCKET NO.:	P00,1725
INTERNATIONAL APPLICATION NO:	PCT/DE99/01185
INTERNATIONAL FILING DATE:	20 APRIL 1999
INVENTION:	NETWORK SWITCHING UNIT FOR A COMMUNICATION SYSTEM

Assistant Commissioner for Patents,
Washington D.C. 20231

REQUEST FOR APPROVAL OF DRAWING MODIFICATIONS

Sir:

Enclosed are 3 sheets of drawings, Figures 1-3, showing in red, the addition of labels to the elements depicted therein. Approval of the additions is respectfully requested.

Submitted by,

Mark Bergner (Reg. No. 45,877)

Mark Bergner
SCHIFF HARDIN & WAITE
PATENT DEPARTMENT
6600 Sears Tower
Chicago, Illinois 60606-6473
(312) 258-5779
Attorney for Applicant(s)

Fig 1

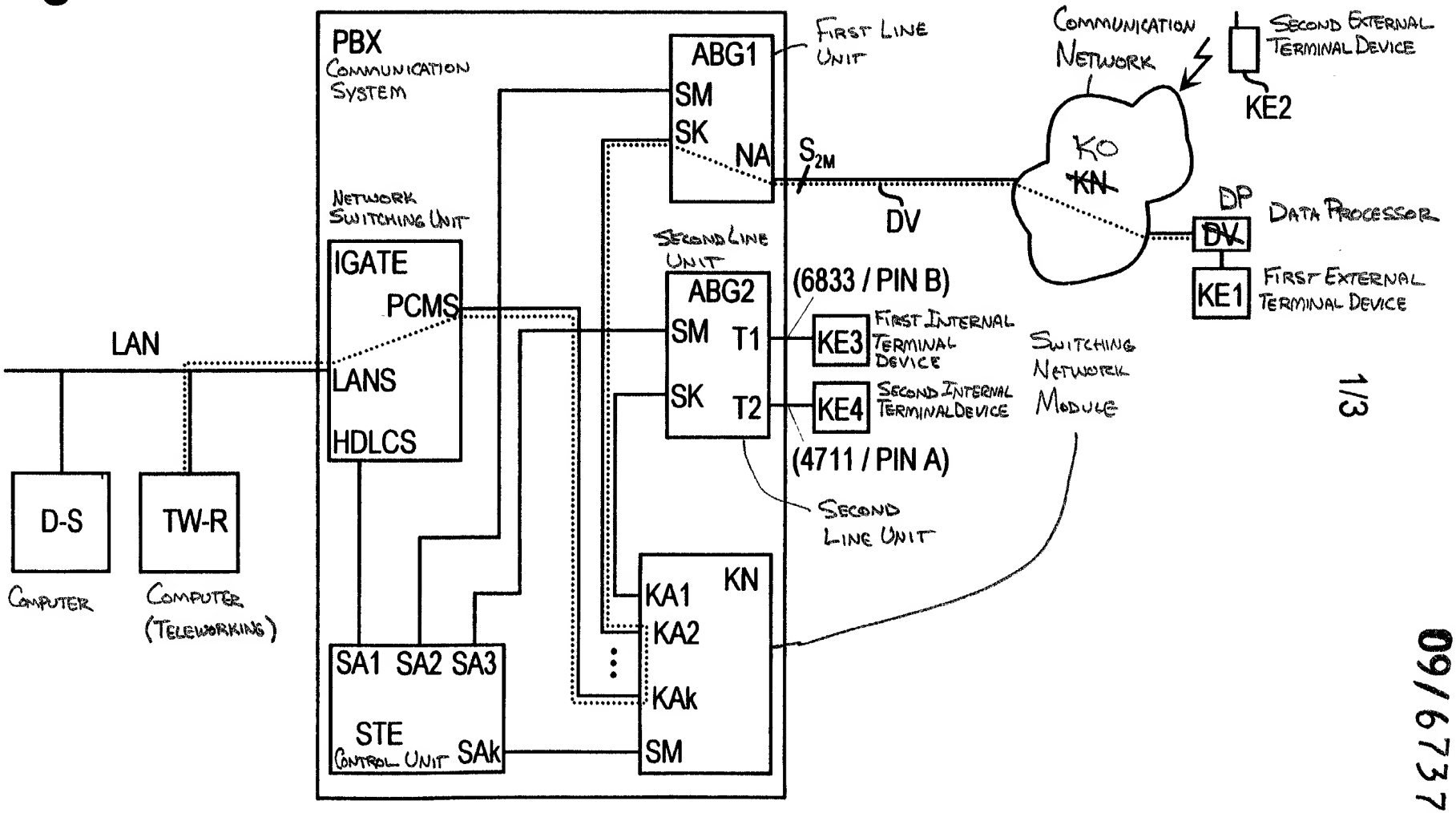


Fig 2

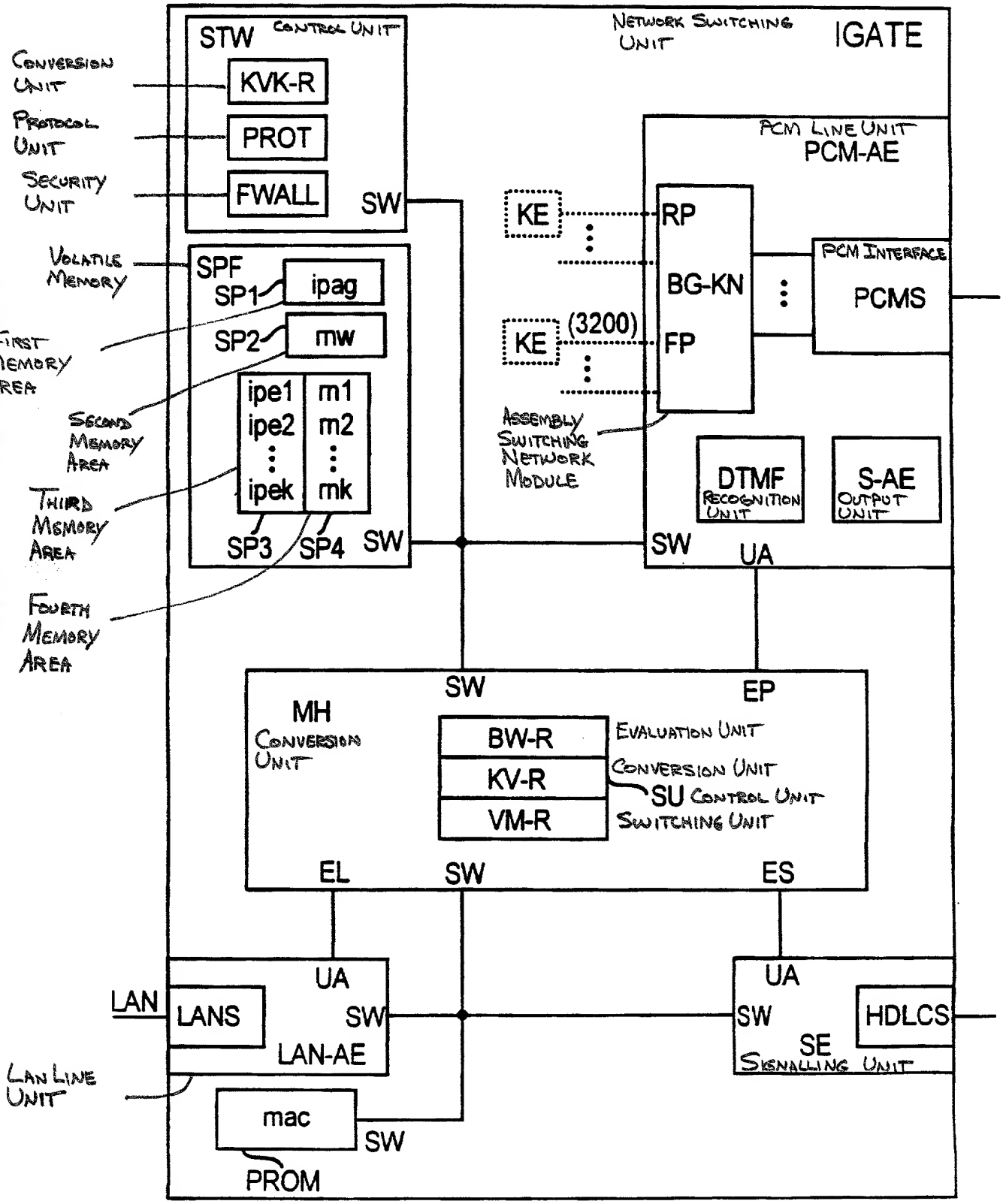
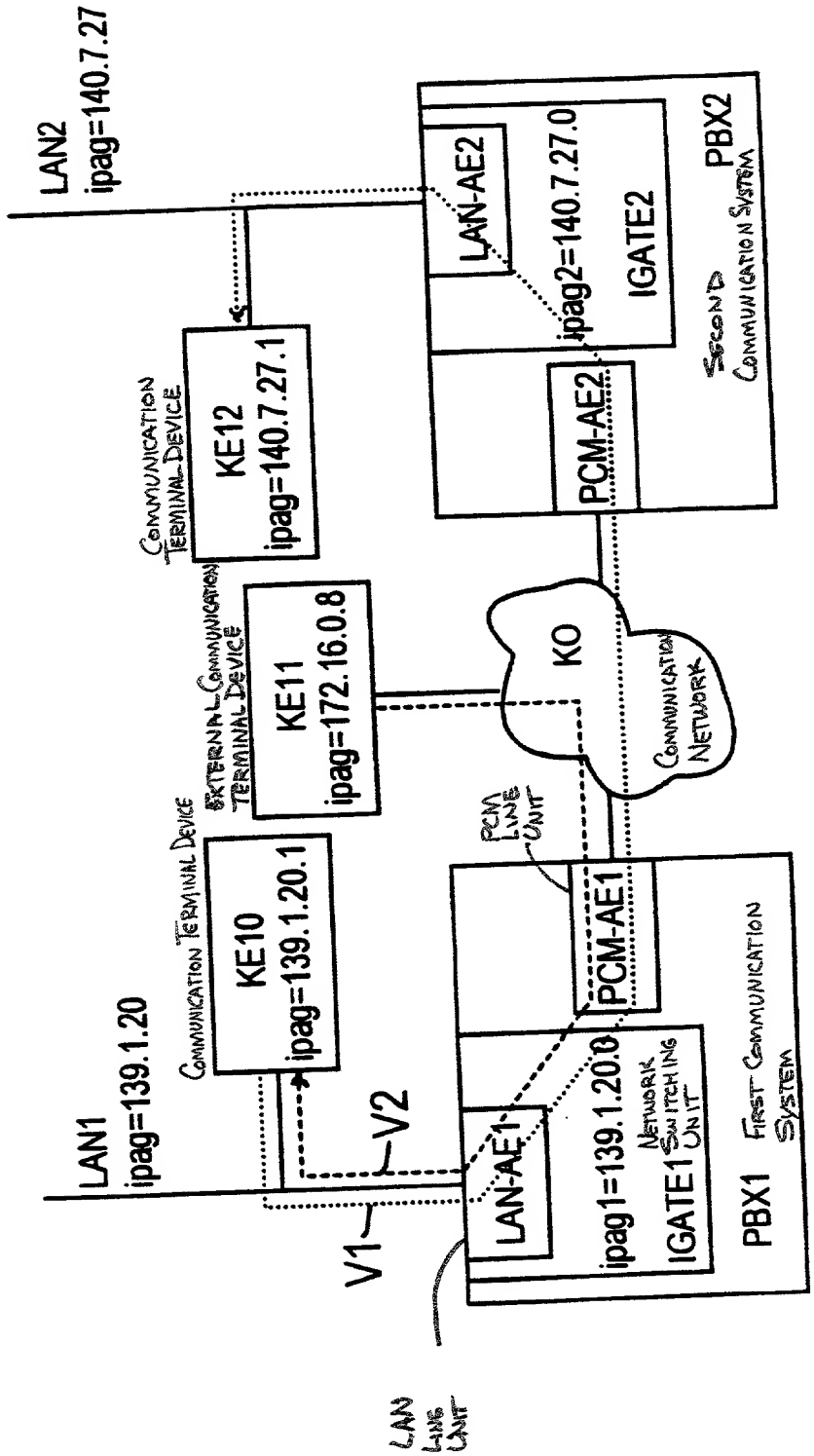

STW
CONTROL UNIT
NETWORK SWITCHING UNIT
IGATE
CONVERSION UNIT
KVK-R
PROTOCOL UNIT
PROT
SECURITY UNIT
FWALL
SW
PCM LINE UNIT
PCM-AE
KE
RP
BG-KN
FP
PCM INTERFACE
PCMS
KE
(3200)
VOLATILE MEMORY
SPF
SP1
ipag
SP2
mw
FIRST MEMORY AREA
SECOND MEMORY AREA
ipe1
ipe2
ipek
m1
m2
mk
THIRD MEMORY AREA
FOURTH MEMORY AREA
SP3
SP4
SW
ASSEMBLY SWITCHING NETWORK MODULE
DTMF RECOGNITION UNIT
S-AE OUTPUT UNIT
SW
UA
SW
EP
MH
CONVERSION UNIT
BW-R
KV-R
VM-R
EVALUATION UNIT
CONVERSION UNIT
SU CONTROL UNIT
SWITCHING UNIT
EL
SW
ES
UA
LAN
LANS
SW
LAN-AE
UA
SW
HDLCS
SE
SIGNALLING UNIT
LAN LINE UNIT
mac
SW
PROM

Fig 3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LAN-AE2
ipag2=140.7.27.0
IGATE2
PBX2
SECOND COMMUNICATION SYSTEM
PCM-AE2
COMMUNICATION TERMINAL DEVICE
KE12
ipag=140.7.27.1
EXTERNAL COMMUNICATION TERMINAL DEVICE
KE11
ipag=172.16.0.8
KO
COMMUNICATION NETWORK
COMMUNICATION TERMINAL DEVICE
KE10
ipag=139.1.20.1
PCM LINE UNIT
PCM-AE1
LAN1
ipag=139.1.20
V2
V1
LAN-AE1
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IGATE1
NETWORK SWITCHING UNIT
PBX1
FIRST COMMUNICATION SYSTEM
LAN LINE UNIT

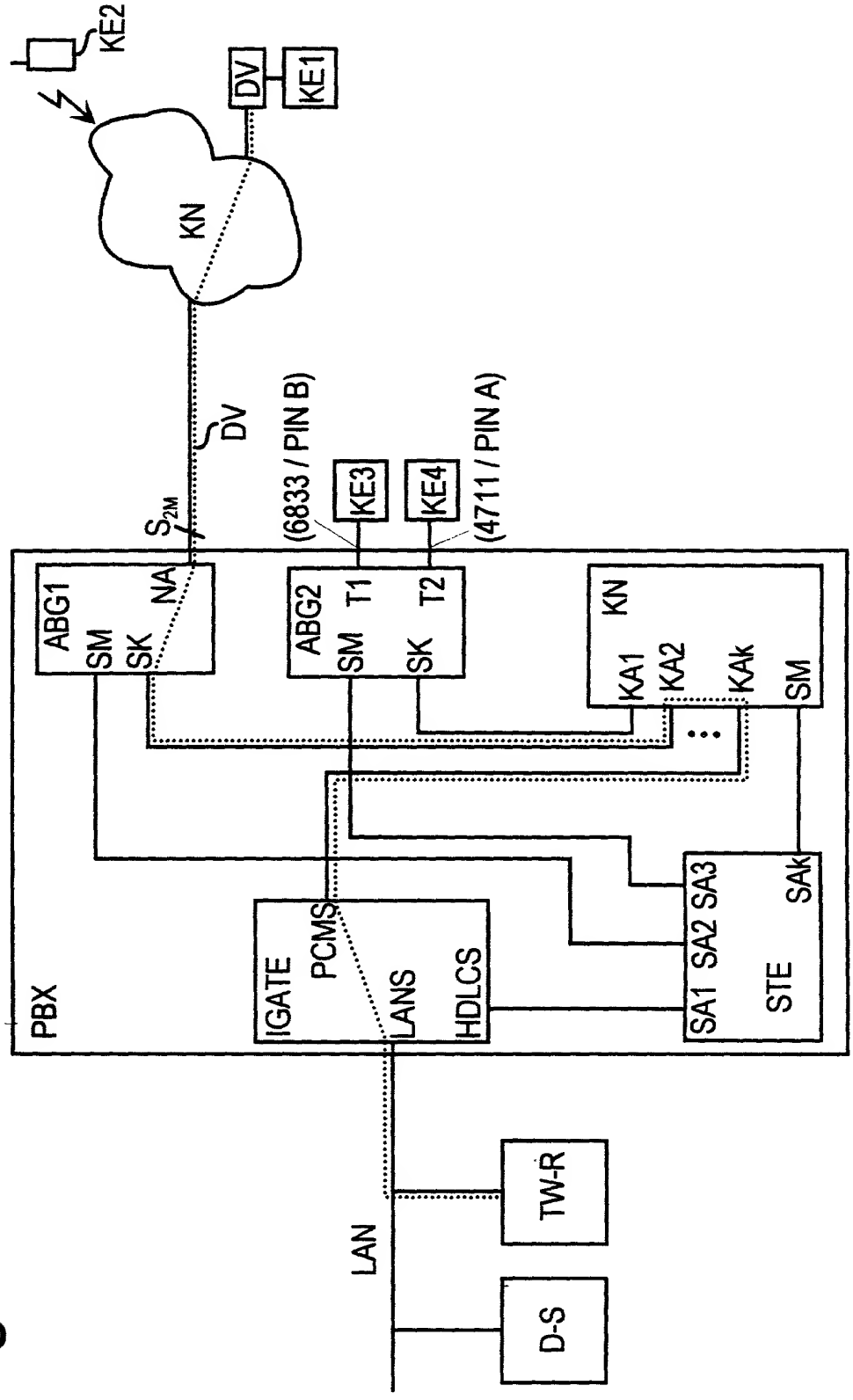

KE2
DV
KE1
KN
DV
S_{2M}
(6833 / PIN B)
KE3
KE4
(4711 / PIN A)
ABG1
SM
SK
NA
ABG2
SM
T1
SK
T2
KN
KA1
KA2
KAk
SM
PBX
IGATE
PCMS
LANS
HDLCS
SA1
SA2
SA3
SAk
STE
LAN
TW-R
D-S

Fig 1

Fig 2

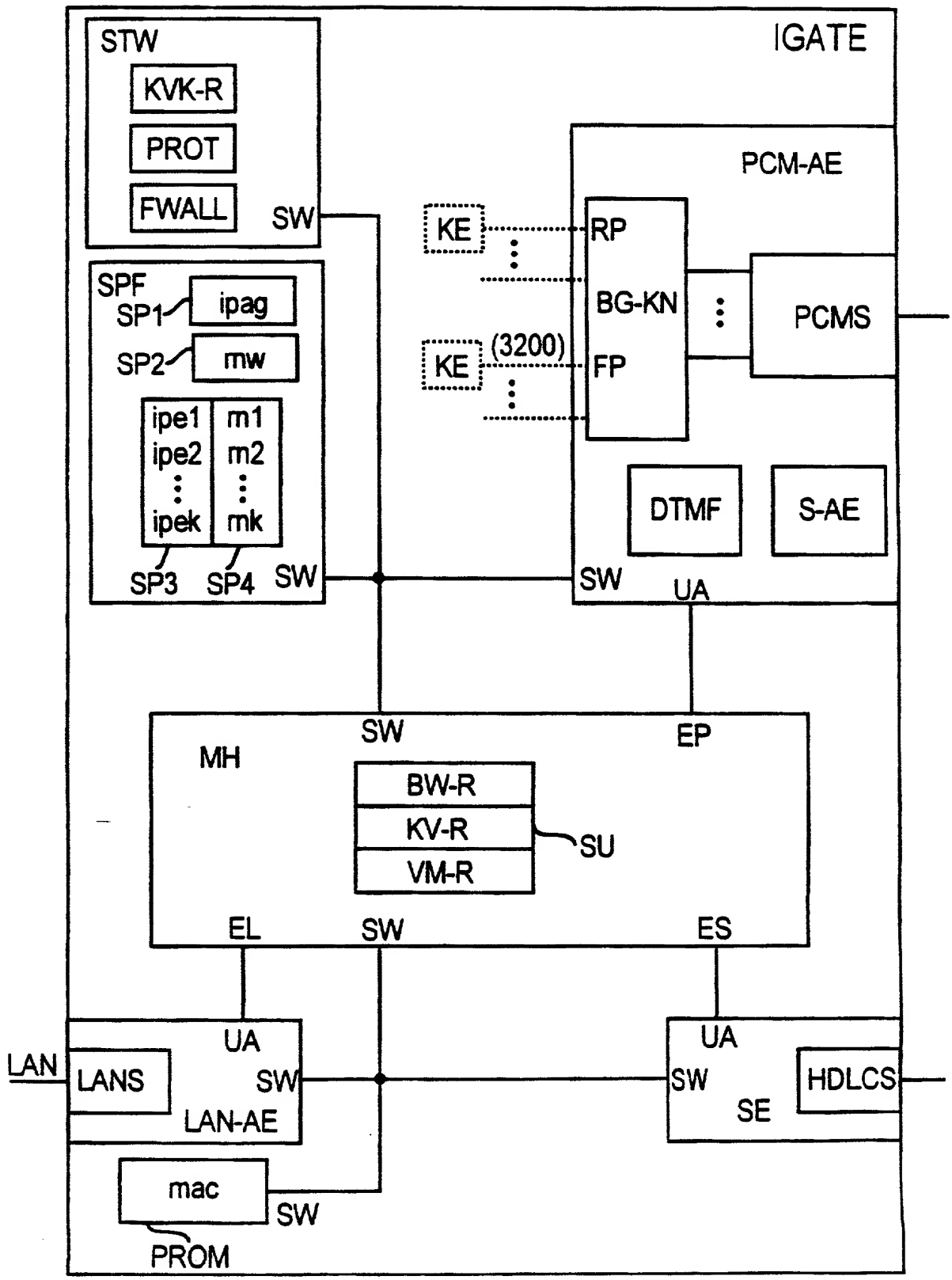
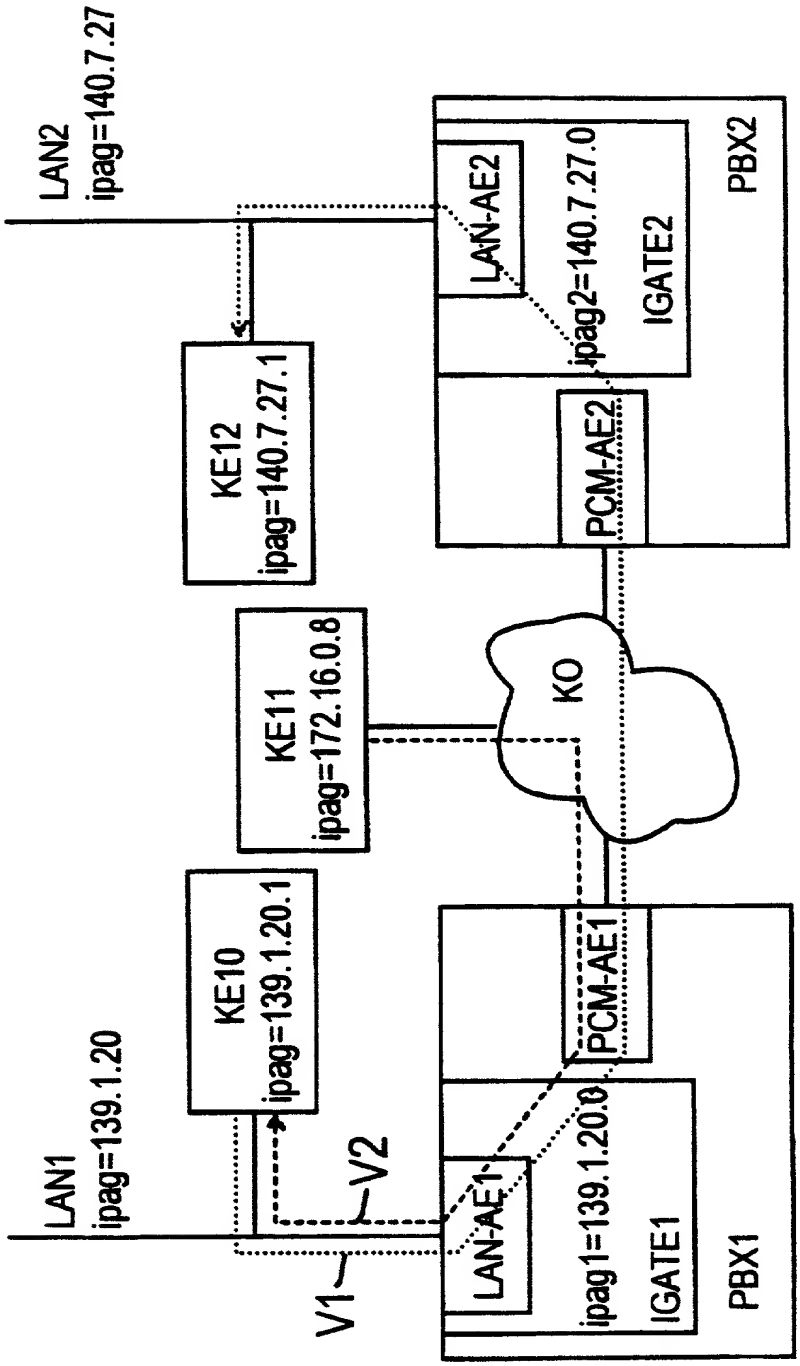

STW
KVK-R
PROT
FWALL
SW
IGATE
PCM-AE
KE
RP
BG-KN
PCMS
KE
(3200)
FP
SPF
SP1
ipag
SP2
mw
ipe1
ipe2
ipek
m1
m2
mk
SP3
SP4
SW
DTMF
S-AE
SW
UA
SW
EP
MH
BW-R
KV-R
VM-R
SU
EL
SW
ES
UA
LAN
LANS
SW
LAN-AE
UA
SW
HDLCS
SE
mac
SW
PROM

Fig 3


LAN2
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KE12
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KE10
ipag=139.1.20.1
LAN1
ipag=139.1.20
V1
V2
KO
LAN-AE2
ipag2=140.7.27.0
IGATE2
PBX2
PCM-AE2
PCM-AE1
LAN-AE1
ipag1=139.1.20.0
IGATE1
PBX1

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INVENTION:	NETWORK SWITCHING UNIT FOR A COMMUNICATION SYSTEM

Assistant Commissioner for Patents,
Washington D.C. 20231

APPOINTMENT OF ASSOCIATE POWER OF ATTORNEY

Dear Sir:

I am an attorney designated on the Power of Attorney for the above-referenced application. I hereby appoint Mark Bergner (Reg. No. 45,877) as an associate attorney, with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

Submitted by,

(Reg. No. 31,870)
Melvin A. Robinson
SCHIFF HARDIN & WAITE
PATENT DEPARTMENT
6600 Sears Tower
Chicago, Illinois 60606-6473
(312) 258-5785
Attorney for Applicant(s)

Declaration and Power of Attorney For Patent Application
Erklärung Für Patentanmeldungen Mit Vollmacht
German Language Declaration

Als nachstehend benannter Erfinder erkläre ich hiermit an Eides Statt:

As a below named inventor, I hereby declare that:

dass mein Wohnsitz, meine Postanschrift, und meine Staatsangehörigkeit den im Nachstehenden nach meinem Namen aufgeführten Angaben entsprechen,

My residence, post office address and citizenship are as stated below next to my name,

dass ich, nach bestem Wissen der ursprüngliche, erste und alleinige Erfinder (falls nachstehend nur ein Name angegeben ist) oder ein ursprünglicher, erster und Miterfinder (falls nachstehend mehrere Namen aufgeführt sind) des Gegenstandes bin, für den dieser Antrag gestellt wird und für den ein Patent beantragt wird für die Erfindung mit dem Titel:

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

Netzkopplungseinheit für ein Kommunikationssystem

deren Beschreibung

(zutreffendes ankreuzen)

☒ hier beigefügt ist.

☐ am _____ als
PCT internationale Anmeldung
PCT Anmeldungsnummer _____
eingereicht wurde und am _____
abgeändert wurde (falls tatsächlich abgeändert).

the specification of which

(check one)

☐ is attached hereto

☐ was filed on _____ as
PCT international application
PCT Application No. _____
and was amended on _____
(if applicable)

Ich bestätige hiermit, dass ich den Inhalt der obigen Patentanmeldung einschliesslich der Ansprüche durchgesehen und verstanden habe, die eventuell durch einen Zusatzantrag wie oben erwähnt abgeändert wurde.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims as amended by any amendment referred to above.

Ich erkenne meine Pflicht zur Offenbarung irgendwelcher Informationen, die für die Prüfung der vorliegenden Anmeldung in Einklang mit Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) von Wichtigkeit sind, an.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

Ich beanspruche hiermit ausländische Prioritätsvorteile gemäss Abschnitt 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 119 aller unten angegebenen Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde, und habe auch alle Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde nachstehend gekennzeichnet, die ein Anmeldedatum haben, das vor dem Anmeldedatum der Anmeldung liegt, für die Priorität beansprucht wird.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

German Language Declaration

Prior foreign appplications Priorität beansprucht			Priority Claimed	
198 17 494.2 (Number) (Nummer)	Germany (Country) (Land)	20. April 1998 (Day Month Year Filed) (Tag Monat Jahr eingereicht)	☒ Yes Ja	☐ No Nein
(Number) (Nummer)	(Country) (Land)	(Day Month Year Filed) (Tag Monat Jahr eingereicht)	☐ Yes Ja	☐ No Nein
(Number) (Nummer)	(Country) (Land)	(Day Month Year Filed) (Tag Monat Jahr eingereicht)	☐ Yes Ja	☐ No Nein

Ich beanspruche hiermit gemäss Absatz 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 120, den Vorzug aller unten aufgeführten Anmeldungen und falls der Gegenstand aus jedem Anspruch dieser Anmeldung nicht in einer früheren amerikanischen Patentanmeldung laut dem ersten Paragraphen des Absatzes 35 der Zivilprozeßordnung der Vereinigten Staaten, Paragraph 122 offenbart ist, erkenne ich gemäss Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) meine Pflicht zur Offenbarung von Informationen an, die zwischen dem Anmeldedatum der früheren Anmeldung und dem nationalen oder PCT internationalen Anmeldedatum dieser Anmeldung bekannt geworden sind.

I hereby claim the benefit under Title 35. United States Code. §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §122, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occured between the filing date of the prior application and the national or PCT international filing date of this application.

(Application Serial No.) (Anmeldeseriennummer)	(Filing Date) (Anmeldedatum)	(Status) (patentiert, anhängig, aufgegeben)	(Status) (patented, pending, abandoned)
(Application Serial No.) (Anmeldeseriennummer)	(Filing Date) (Anmeldedatum)	(Status) (patentiert, anhängig, aufgeben)	(Status) (patented, pending, abandoned)

Ich erkläre hiermit, dass alle von mir in der vorliegenden Erklärung gemachten Angaben nach meinem besten Wissen und Gewissen der vollen Wahrheit entsprechen, und dass ich diese eidesstattliche Erklärung in Kenntnis dessen abgebe, dass wissentlich und vorsätzlich falsche Angaben gemäss Paragraph 1001, Absatz 18 der Zivilprozessordnung der Vereinigten Staaten von Amerika mit Geldstrafe belegt und/oder Gefängnis bestraft werden koennen, und dass derartig wissentlich und vorsätzlich falsche Angaben die Gültigkeit der vorliegenden Patentanmeldung oder eines darauf erteilten Patentes gefährden können.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

German Language Declaration

VERTRETUNGSVOLLMACHT: Als benannter Erfinder beauftrage ich hiermit den nachstehend benannten Patentanwalt (oder die nachstehend benannten Patentanwälte) und/oder Patent-Agenten mit der Verfolgung der vorliegenden Patentanmeldung sowie mit der Abwicklung aller damit verbundenen Geschäfte vor dem Patent- und Warenzeichenamt: *(Name und Registrationsnummer anführen)*

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. *(list name and registration number)*

And I hereby appoint

Messrs. John D. Simpson (Registration No. 19,842) Lewis T Steadman (17,074), William C. Stueber (16,453), P. Phillips Connor (19,259), Dennis A. Gross (24,410), Marvin Moody (16,549), Steven H. Noll (28,982), Brett A. Valiquet (27,841), Thomas I. Ross (29,275), Kevin W. Guynn (29,927), Edward A. Lehmann (22,312), James D. Hobart (24,149), Robert M. Barrett (30,142), James Van Santen (16,584), J. Arthur Gross (13,615), Richard J. Schwarz (13,472) and Melvin A. Robinson (31,870), David R. Metzger (32,919), John R. Garrett (27,888) all members of the firm of Hill, Steadman & Simpson, A Professional Corporation.

19

Telefongespräche bitte richten an: *(Name und Telefonnummer)*

Direct Telephone Calls to: *(name and telephone number)*

312/876-0200
Ext. _____

Postanschrift:

Send Correspondence to:

HILL, STEADMAN & SIMPSON
A Professional Corporation
85th Floor Sears Tower, Chicago, Illinois 60606

Voller Name des einzigen oder ursprünglichen Erfinders: WEHREND, Klaus	Full name of sole or first inventor:
Unterschrift des Erfinders Datum Klaus Wehrend 19.4.99	Inventor's signature Date
Wohnsitz D-82223 Eichenau, Germany DEX	Residence
Staatsangehörigkeit Bundesrepublik Deutschland	Citizenship
Postanschrift Eichenstr. 1	Post Office Addess
D-82223 Eichenau Bundesrepublik Deutschland	
Voller Name des zweiten Miterfinders (falls zutreffend):	Full name of second joint inventor, if any:
Unterschrift des Erfinders Datum	Second Inventor's signature Date
Wohnsitz	Residence
	Citizenship
	Post Office Address

(Bitte entsprechende Informationen und Unterschriften im Falle von dritten und weiteren Miterfindern angeben).

(Supply similar information and signature for third and subsequent joint inventors).